MAR 1 2 1928

TWENTY-FIFTH YEAR

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The Heating and Ventilating Magazine

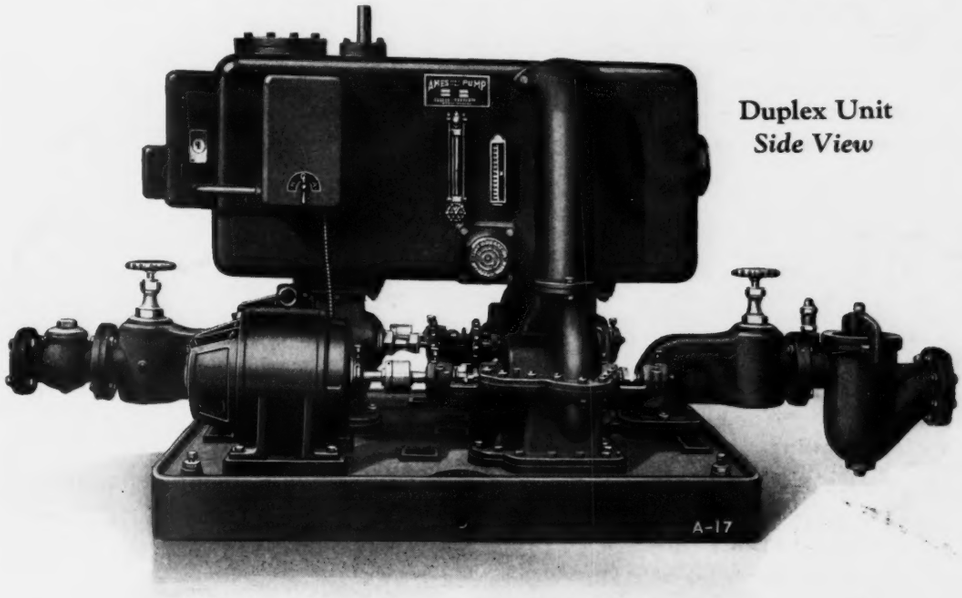
A Monthly Journal of Engineering Progress

Vol. XXV. No. 3.
$2.00 a year. 30 cents a copy.

MARCH, 1928

Heating & Ventilating Magazine Co.
386 Fourth Avenue, New York.

It Does the Work!



Duplex Unit
Side View

The AMES Pump

A Distinctively Different Vacuum Heating Pump

With a THREE YEAR Guarantee

Conceived, designed and built for the elimination of pump troubles. The Ames Pump embodies in its construction every feature known in modern pump design.

Maximum accessibility, durability and efficiency—minimum installation and maintenance costs. A unit, complete, with full automatic and manual control.

Write for Bulletin 52-C3

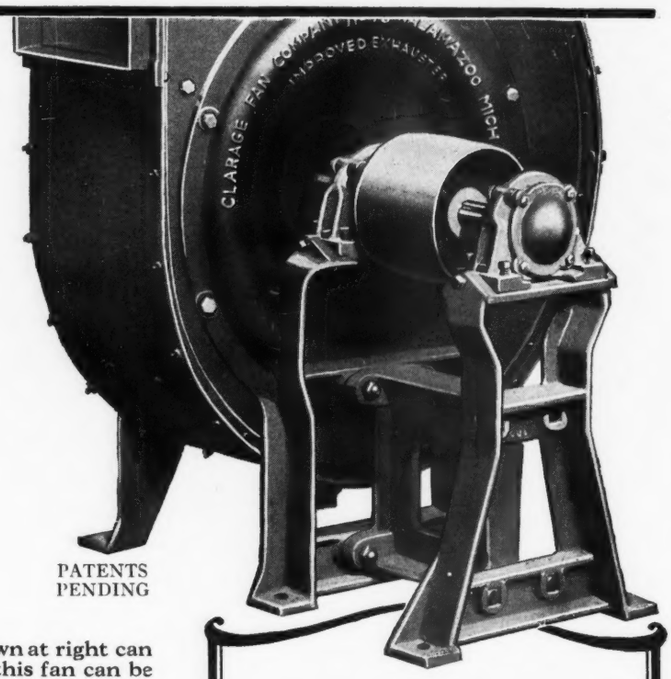
AMES PUMP COMPANY, Inc.

Division of STATEN ISLAND SHIPBUILDING CO.

90 West Street New York, N. Y.

DISTINCTIVELY DIFFERENT

Seven Reasons Why



PATENTS PENDING

Announcing a New Clarage Development in Exhaust Fan Equipment

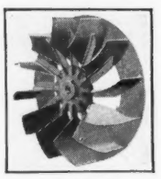
1. *Universal Application:* Any of the six wheels shown at right can be efficiently used in the new exhauster. Thus this fan can be changed over from one job to another at the small cost of an additional Clarage wheel. This one type of fan and the necessary Clarage wheels enable you to meet all requirements with a minimum investment.
2. *Higher Efficiencies:* Regardless of which wheel is used in the fan housing, power requirements are reduced to a new low minimum.
3. *Slower Speeds:* Operating speeds for any condition are much lower than common practice—less wear on bearings, shaft and wheel—a longer-lived fan.
4. *Outside Bolting of Scroll Sheet:* This new feature makes replacement a short, simple job.
5. *Thoroughly Tested:* All wheels are tested for balance and every assembled fan is placed in operation before shipment.
6. *Dust-proof, Oil-tight Bearings:* Bearings are also self-aligning and extra large.
7. *Reversible:* Eight different discharges are available by merely unbolting the sideplates and turning housing to desired angle.

Write for our Announcement Bulletin, giving you all the facts. This new Clarage development points the way toward a creditable saving in exhaust fan equipment and its operation.

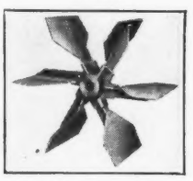
CLARAGE FAN COMPANY, Kalamazoo, Mich.
Sales Engineering Offices in 25 Cities

Use Any of These Wheels in This Fan

TYPE C, HIGH PRESSURE WHEEL


SLOW SPEED, LOW POWER WHEEL

RIM TYPE, MEDIUM PRESSURE WHEEL


LONG SHAVINGS, MATERIAL HANDLING WHEEL

REMBERT WHEEL FOR COTTON HANDLING

WOOL WHEEL FOR STRINGY MATERIALS

CLARAGE
New Improved Exhauster

KEWANEE STEEL Riveted BOILERS

In the purchase of a boiler there are two vital things which must be considered: The *first cost* and the *upkeep cost*.

If the first cost is *too low* you may be sure the upkeep cost will be *too high*. You'll soon be forced to replace a cheap heater, or else you'll pay added installments on the first cost every year in the form of bigger fuel and repair bills.

With a Kewanee *the first cost is paid but once*—for a Kewanee Boiler outlasts the building it heats with such high efficiency.

So remember: The upkeep cost of a boiler (which includes all expenditures for fuel and repairs) extends over the whole period of its life. The excess upkeep of an inefficient boiler must be paid every year.

But with Kewanee Boilers repair bills are almost nil and expenditures for fuel as near the minimum as it is possible to attain.

That is why Kewanee has such an enviable reputation as the most economical "boiler buy".

Low Heating Cost

KEWANEE BOILER CORPORATION

Kewanee, Illinois ***Branches in Most Leading Cities***

STEEL HEATING BOILERS RADIATORS WATER HEATERS TANKS AND WATER HEATING GARBAGE BURNERS

THE HEATING AND VENTILATING MAGAZINE, published by the THE HEATING AND VENTILATING MAGAZINE CO., at 386 Fourth Avenue, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXV, No. 3, March, 1928. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

Rugged Strength

looms up as a deciding factor in selecting boilers for schools.

BOILERS for schools must have great strength built into them — for safety. Here, if anywhere, safety is a paramount consideration.

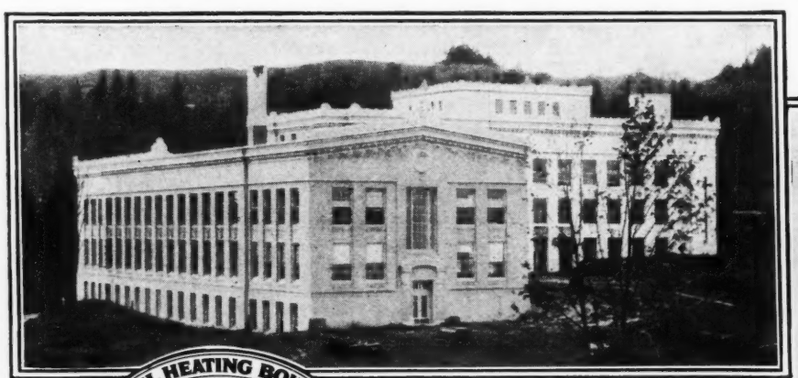
Pacific Steel Heating Boilers meet this urgent requirement of school installations. To the inherent strength of steel—the strongest structural material available for building boilers — is added the strength of Pacific Construction. In the Pacific, joints are electric arc welded — the same construction that is used in battleships, bridges, etc.; also in mammoth hydraulic presses, employing pressures hundreds of times as great as the operating pressure of Pacific Heating Boilers.

This wide margin of safety in Pacific Boilers is also a factor in dependable, trouble-free operation. Pacific equipment is leak-proof, break-proof — not subject to sudden shutdowns for repairs, in zero weather. And the Pacific has established performance records second to none — for high efficiency, overload capacity, low flue gas temperatures, dry steam. Write for complete information.

PACIFIC

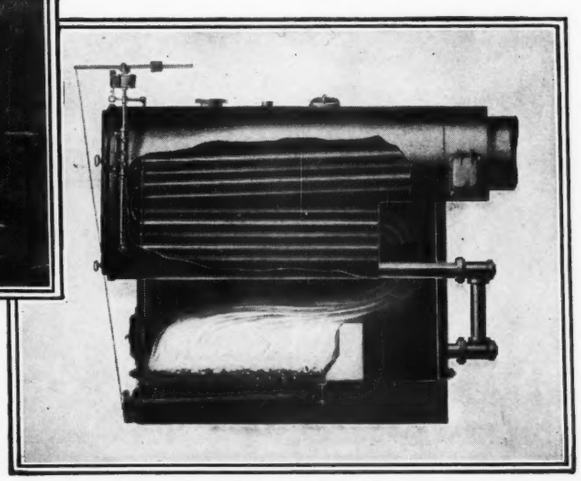
STEEL HEATING BOILERS

Factories •• WAUKEGAN, ILLINOIS •• BRISTOL, PA.



STEEL HEATING BOILERS PACIFIC WAUKEGAN, ILL. BRISTOL, PA.
TRADE MARK REG. U.S. PAT. OFF.

University of Oregon Medical School, Portland, Oregon. Lawrence & Holford, Architects. Geo. E. Reed, Engineer. One 11,500 square foot Pacific Boiler installed by the Alaska Plumbing & Heating Co.



Page Smokeless Is Fuel Saving and Law Abiding

Illustrated is the 40″ Monarch Smokeless Boiler, showing three-way fire travel, auxiliary air inductor, and primary and secondary combustion chambers, recommended when it is desired to burn soft coal, or to install a boiler in which soft coal may be burned in the event of a shortage of hard coal.

This Smokeless construction, by means of a device, simple but correct in principle, for the admission of auxiliary air over the fire, will burn the cheapest grades of soft coal without smoke, complying with the most rigid smoke ordinances, and effecting savings as high as 33-1/3%, as compared with soft coal consumption in boilers of the usual type, this without the skilled care and excessive attention required in other boilers.

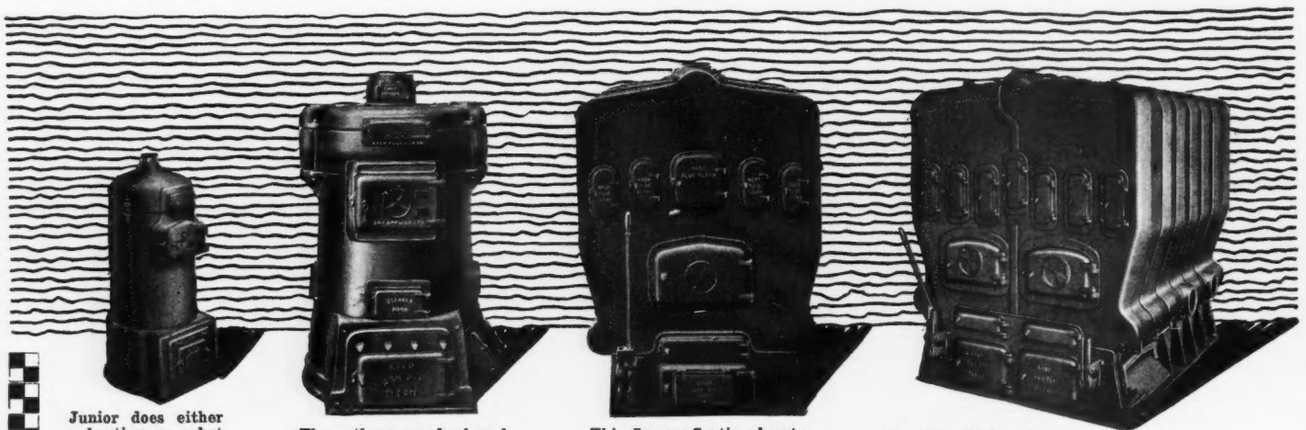
The Monarch Smokeless Boiler is but one of a most complete line of Page Boilers, for every heating need. Send for 1928 Catalogue, and profit yielding prices.

THE WM. H. PAGE BOILER COMPANY

Makers of a Complete Line of Round and Square Steam and Hot Water Boilers

General Offices: 200 Madison Ave., New York

Branch Offices and Warehouses: BOSTON, 123 Beverly St.; CLEVELAND, Rose Bldg.; PHILADELPHIA, 1126 Washington Ave. BROOKLYN, 98-49th St. Factory: MEADVILLE, PENNSYLVANIA.



Junior does either a heating or a hot water supply job, or both on occasion.

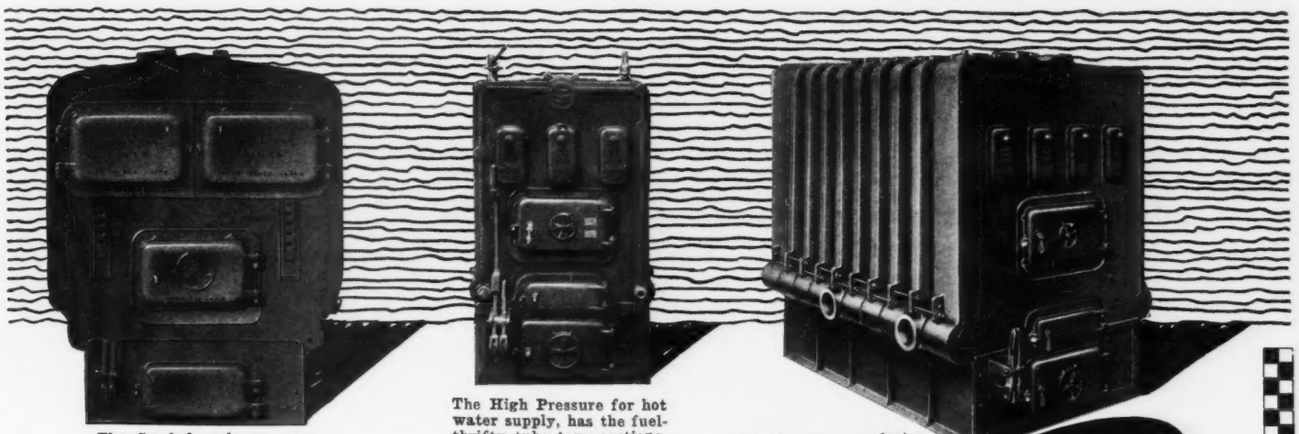
The three-way-back-and-forth fire travel Round Sectional is the boiler for average residence and business building.

This Square Sectional gets its long fire travel another way, and does its bit toward making fuel bills shorter.

The Big Twin steps in, when the heating job to be done is a big one.

Now You Have The Whole Bag of Tricks In Burnham

They make noisy oil burners quiet,— and quiet ones quieter, muffling down the sounds of combustion.



The Smokeless is as easy to erect as any Burnham Sectional. As easy as it looks.

The High Pressure for hot water supply, has the fuel-thrifty tube type sections.

Here's the perfect 36, latest addition to the Burnham tube type line.

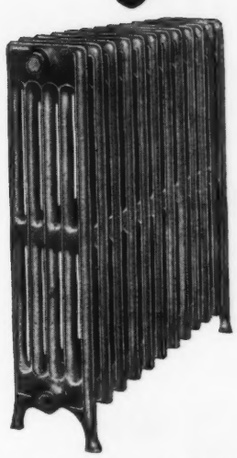
Boilers

Why waste your time, money and patience shopping 'round? Everything from soup to nuts, that you need on your heating and hot water supply jobs in the cast iron boiler line is listed in our Catalog No. 67.

There's not a break in the line, from laundry stoves and junior boilers, to big twin sectionals.

And besides there are equally complete lines of Burnham radiators, tanks and a raft of heating supplies, all in stock and at your call. There's a Burnham plant or warehouse that serves your territory—and a Burnham man who will come to you when you want him.

Let's get together, for better business and more of it.

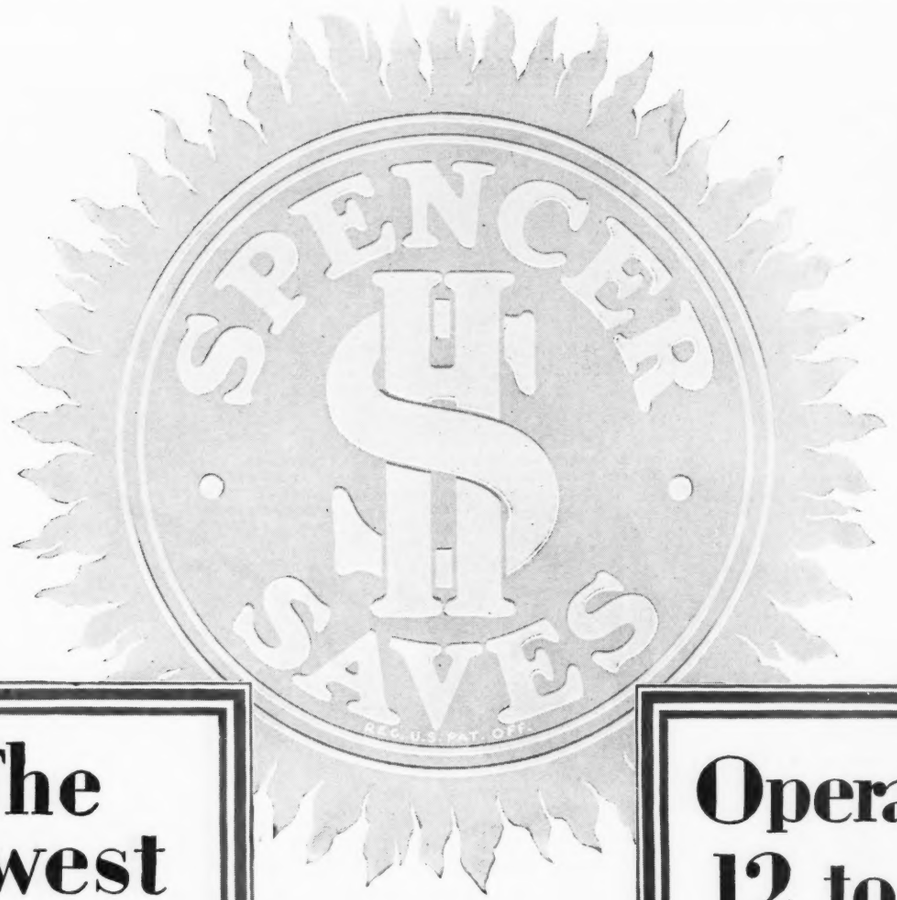


Complete Stocks of Burnham Fero Radiators carried at each of our plants and warehouses.

Burnham Boiler Corporation

IRVINGTON, N. Y.

REPRESENTATIVES IN ALL PRINCIPAL CITIES OF THE UNITED STATES AND CANADA.



The Lowest cost heat you can buy

Operates 12 to 24 hours without attention

Spencer

steam . vapor or hot water

Heaters

SPENCER HEATER COMPANY *General Offices:* WILLIAMSPORT, PA.

New York City Boston Philadelphia Baltimore Buffalo Rochester Hartford Albany Syracuse Scranton

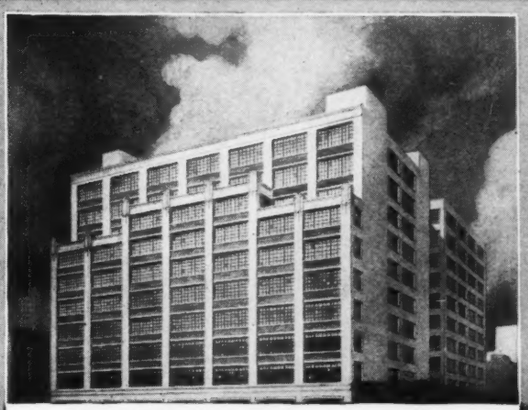
Division of Lycoming Manufacturing Company

STEAM CAPACITIES: Cast Iron Sectional *from 600 feet to 3,200 feet.* Steel Tubular *from 2,000 feet to 16,000 feet*

You will find TICO BOILERS in all of these PROMINENT NEW YORK CITY BUILDINGS

erected under the supervision of

FRANK S. PARKER, ARCHITECT AND ENGINEER
280 MADISON AVE., NEW YORK



Friedman Building - Two T - 161 Tico Boilers

Graphic Arts Building - Three T-250 Tico Boilers

Margolies Building - Two T-72 Tico Boilers

Warren-Nash Service Station-Two 250 hp. Tico Boilers

"Printing Arts Center"
Four 250 HP Tico Boilers

UPON the unexcelled performance record of Titusville Boilers, their remarkable fuel economy and their high heating efficiency hinges the sound judgment of many careful architects and builders.

Note, for example, these Tico equipped New York City buildings. They combine beautiful architectural exteriors with warm and comfortable interiors—for Tico Boilers are designed with ample heating capacity to meet the sudden fluctuations of winter's coldest temperatures.

Why not incorporate the particular advantages of Tico Boilers in your next building?

The Titusville Iron Works Co.
Titusville, Penna.

Sales Offices

New York
Detroit, Mich.
St. Louis, Mo.
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Cleveland, Ohio
Pittsburgh, Pa.
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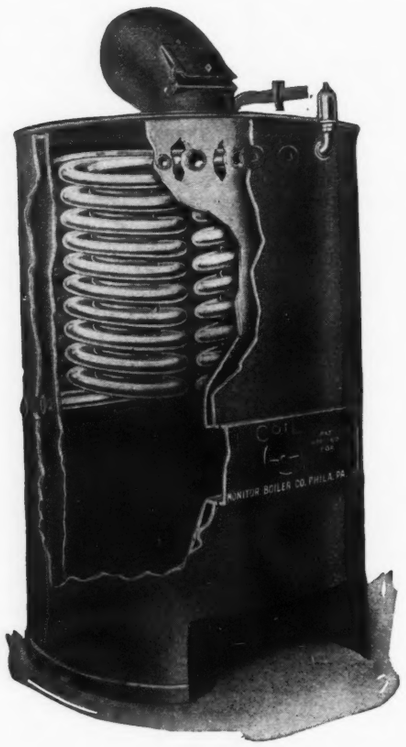
Chicago, Ill.
Los Angeles, Calif.
Charlotte, N. C.

Fuller-Luce Building-"Lincoln Service"
Two T-115 Tico Boilers

FOR OIL BURNING



COIL

STEEL HEATING BOILERS AND WATER HEATERS

In Coil Boilers, the heat passes through and over more heating surface than in the average heating boiler.

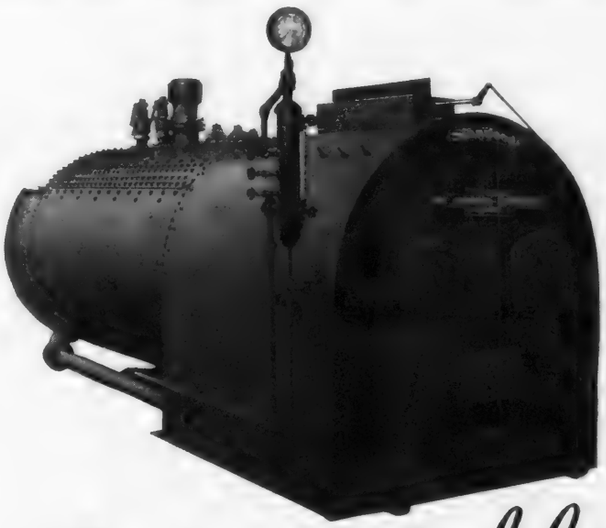
This surface is highly effective because it is "within view" of the flame, hence, capable of absorbing the radiant heat.

This results in fuel savings of from 25% to 40%, as many users of Coil Boilers have told us.

Not only are Coil Boilers doing this with oil but with coal.

If desirable, Coil Oil Burning Boilers can be fitted with grates, shaking apparatus, etc., in thirty minutes' time. Write for catalog.

MONITOR BOILER COMPANY
1505 Race Street
PHILADELPHIA, PA.



Dependable

when—

there are no crown sheets to expand and contract, warp, sag and finally fail. . . .

there are no circumferential seams in the fire area to crack and leak. . . .

there are no mud legs to collect sediment and necessitate frequent cleaning. . . .

rapid water circulation assures quick, steady steaming, in the morning and in any emergency . . .

month after month, year after year goes by and, it is evident, that only the most insignificant maintenance has been necessary. . . .

then—

it can be truthfully said of a boiler that it is dependable.

Such is the Stanwood Boiler.

Apart from the lower first cost of installation, remarkable fuel economy and insignificantly low maintenance cost, it is worth much to have the reliable, carefree characteristics of the Stanwood to lean on, whether for power or heating.

Stanwoods are regularly built in sizes from 29 to 250 H.P. (3,500 to 31,000 sq. ft. steam radiation) and for working pressures of 15, 100, 125 and 150 lbs. Built for higher pressures to order.

ALL STEEL RIVETED CONSTRUCTION

Stanwood Smokeless Boilers

THE STANWOOD CORPORATION

Manufacturers of Smokeless Boilers, Horizontal Return Tubular Boilers, Stacks, Breechings, Tanks, Feed Water Heaters and Throttling and Automatic Steam Engines.

Est. 1891 **Cincinnati, Ohio.**

THE STANWOOD CORPORATION, Dept. D-38
Cincinnati, Ohio.

Please send me pamphlets describing in detail the Stanwood Boiler.

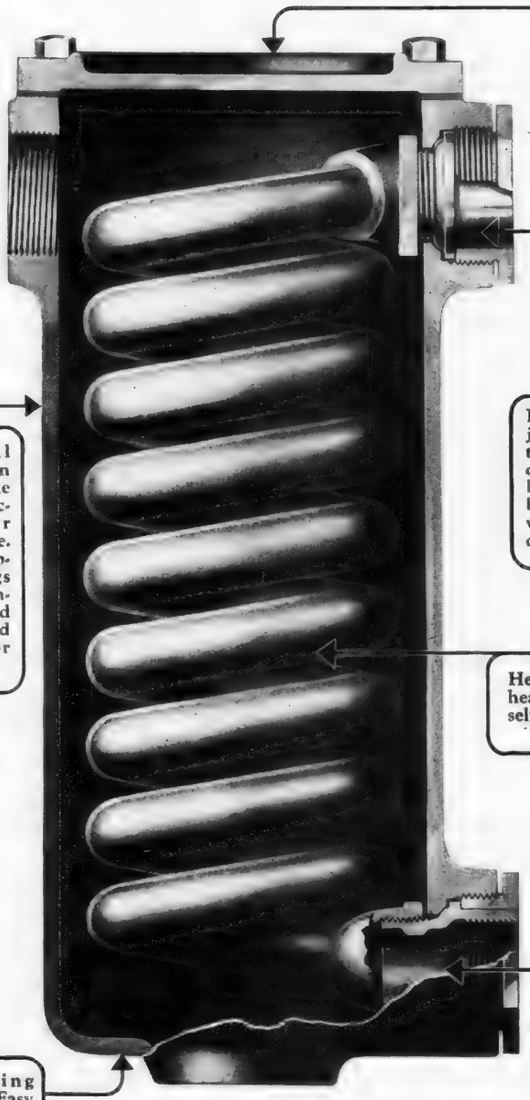
Name .....

Business .....

Address .....

Cross Section of EXCELSO Indirect Water Heater for Steam and Vapor Heating Boilers.

Plenty of HOT WATER


Cover plate at top of casting. Easy to remove if necessary. Leak proof, avoiding split casting and opportunities for trouble.
Heavy, well made gray iron casting. The most satisfactory heater shell made. There are tapped openings for boiler connections and machined openings for the coil.
EXCELSO patented ground joint connections. No gaskets to give trouble. Every drop of domestic hot water passes thru heavy copper coil and patented brass connections, exclusive with EXCELSO--resulting in clear pure hot water.
Heavy copper coil heating element — self draining.
Self draining heater shell. Easy to clean if necessary.

Practically Without Cost

from the genuine Excelso Water Heater.

Write for catalog giving installation information, telling the story of Hot Water at lowest possible cost.

Excelso Products Corporation
DIVISION OF AMERICAN RADIATOR COMPANY
59 CLYDE AVE., BUFFALO, N. Y.

NATIONALLY DISTRIBUTED BY LEADING WHOLESALERS AND BOILER AND RADIATOR MANUFACTURERS

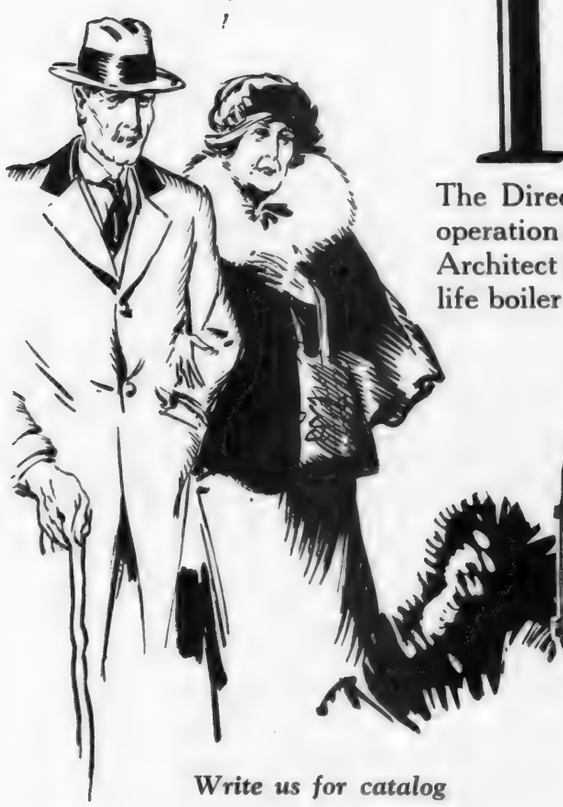
EXCELSO WATER HEATERS

Sold by All Plumbers and Steamfitters

SIZES FOR ONE FAMILY OR ONE HUNDRED FAMILIES

Old Folks Home
KIRKWOOD, MO.

MARCEL BOULICAULT
ARCHITECT



THOSE who reside in the Old Folk's Home at Kirkwood, Missouri, have solid contentment in the knowledge that comfort and warmth are assured them by the installation of a Ross Steel Heating Boiler.

Those who operate this Boiler are happy on account of its long firing periods and accessibility for cleaning.

The Directors of the Home are pleased with the economy in operation and the high efficiency that is shown. And, lastly, the Architect has a satisfied feeling that the Ross Steel Boiler is a long life boiler of superior construction.

Write us for catalog

The Frost Manufacturing Co.
1520 Henderson Street
GALESBURG, ILL.

Eastern Distributors: The Ross Boiler Co., Inc., 101 Park Ave., New York
Branches in all leading cities
Seventy-seven years of active boiler building experience

ROSS STEEL BOILERS

—when there is an ADSCO Expansion Joint that will do it better

For every pipe expansion problem there is a specially designed ADSCO Expansion Joint.

A low pressure steam riser should have one type of internally guided joint; a line conveying high pressure superheated steam requires quite a different type of externally guided joint with air cooled slip to prolong the life of the packing.

ADSCO expansion joints are designed not only to meet every operating condition of pressure and temperature for steam, water, oil and other liquids and gases, but to combine such cost-reducing features as double and single joints in all designs, combinations of anchorage, service and drip outlets.

The ADSCO standard line of joints includes every combination of slip type as well as packingless joints (variators). In addition there are hundreds of special joints for special conditions.

You should have the "Blue Book on Expansion in Pipes" —send for it as the first step in solving all your expansion problems.

AMERICAN DISTRICT STEAM COMPANY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.
Expansion Joint leaders for 50 years

To be sure of getting
ADSCO
Expansion Joints
order direct

The first step is to get this book

AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, N. Y.

Gentlemen:

Kindly send me your new book, "Reference Data on Expansion in Pipe Lines."

Name..... Position.....

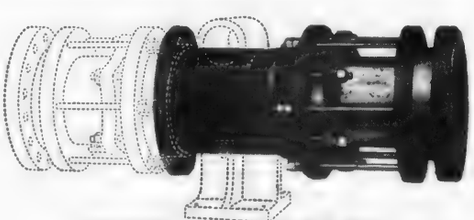
Company.....

Street..... City.....

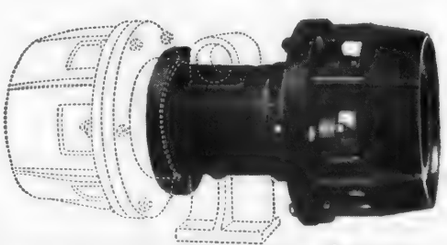
The dotted lines illustrate some of the combinations of ADSCO Expansion Joints

ADSCO BI, all brass screwed end joint Furnished internally guided (RI) for risers

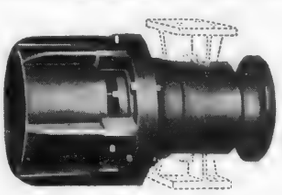
ADSCO Semi-Guided joints in 125 lb. and 250 lb. designs



ADSCO Semi-Guided Tie Rod Joints



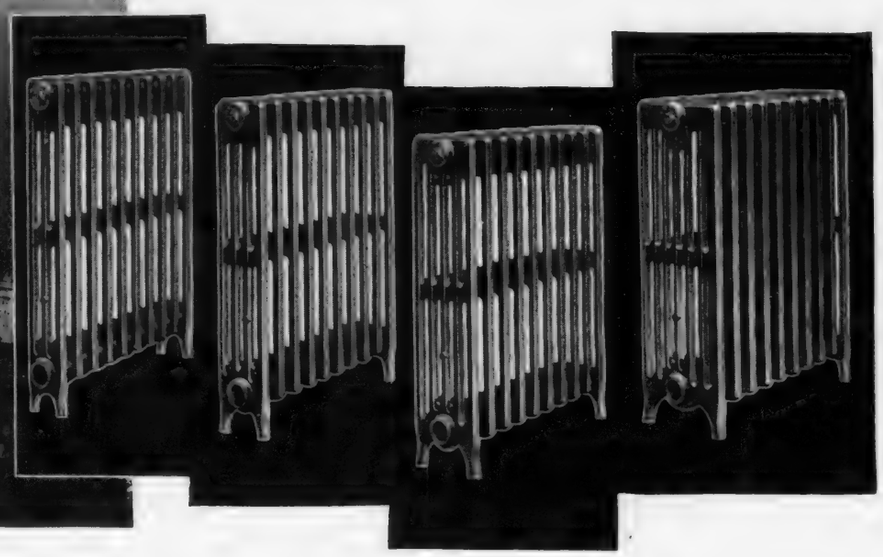
Externally guided designs for 125 lb. and 250 lb lines.



ADSCO Duplex Sleeve guided (Air Cooled Slip) joints for pressures up to 500 lb. and temperatures to 750° F.

Central Mercantile Bank Building, New York. Architect: H. Craig Severance. Engineer: H. Hall Marshall. Heating Contractor. Baker-Smith Co. Aero Radiation.

AERO
makes them ask "who did the heating?"



YOU'LL find that Aero jobs make visitors ask, "Who did the heating?" For Aero—the National Radiator—combines beauty and warmth in a way that never fails to excite comment.

Back of Aero—the National Radiator—is a record of more than 6 years of proved performance, that guarantees trouble-free service, and permanent customer-satisfaction.

Each Aero job is one more permanent advertisement for the fitter who installed it. One that is working, always, to bring him more business, increasing profits, greater goodwill.

NATIONAL RADIATOR CORPORATION

Ten plants devoted to National Service through these Branch Offices and Warehouses:

Baltimore, Md.—2622 Frisby Street Boston, Mass.—93-97 Oliver Street Indianapolis, Ind.—57 S. Bolton Ave. New York, N. Y.—55 W. 42nd St.
Buffalo, N. Y.—McKinley Building, Delaware Avenue Philadelphia, Pa.—121 N. Broad Street
Chicago, Ill.—2445 N. Keeler Ave. Cleveland, Ohio—935 E. 63rd Street Pittsburgh, Pa.—1509 Arrott Bldg. Richmond, Va.—3032 Norfolk Street
Cincinnati, Ohio—Spring Grove and Elmira Avenue Washington, D. C.—2205 Fifth Street, N. E.

AERO THE NATIONAL RADIATOR

A
flaw in a
piece of heat transfer
equipment may mean the loss of life
and money. Deviations from specifications are always costly in the long run. Anything less than the best engineering practice and construction methods invariably invites trouble and production losses. Delivery delays are a poor remedy for industrial growing pains. ¶ When you contract with Heat Transfer Products, Inc., you fortify your responsibility by a mighty shield of

PROTECTION

Heat Transfer Products, Inc., protects you against inferior design by means of employing the best engineering skill available ¶ Protects you against poor manufacturing methods by owning and operating the most modern plant in the industry. ¶ Protects you against unsuitable parts by producing in its own shops practically every unit required for every piece of apparatus it builds. ¶ Protects you against delivery delays by manufacturing and assembling, under one unified supervision, every piece of equipment it constructs. ¶ Protects you against defects in materials by maintaining its own metallurgical control laboratory. ¶ And protects you against trouble and costly breakdowns by utilizing proper equipment for adequate shop tests. ¶ You incur no obligation whatever by consulting Heat Transfer Products, Inc., about your problems. But you do invoke the services of the most complete organization manufacturing heat transfer apparatus. And you are assured of the most competent advice obtainable. ¶ It will pay you to consult us

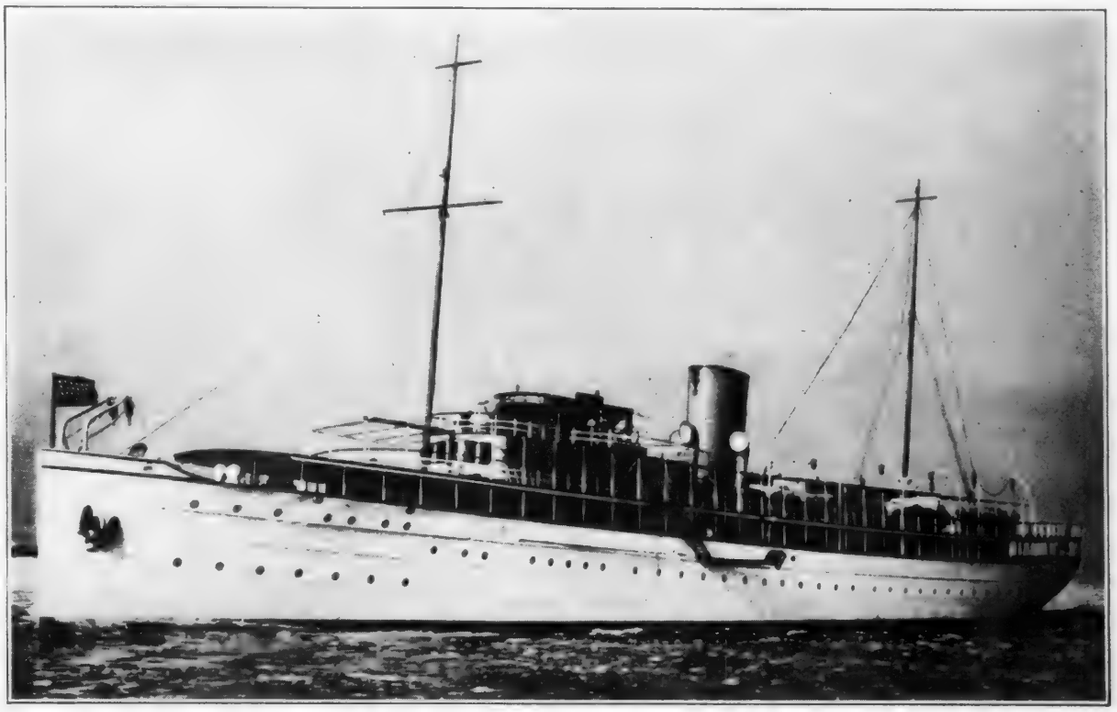
•

Engineering data and estimates will be gladly furnished on equipment for the following applications:

Power Plants	Chemical Plants	Refrigeration
Oil Refining	Air Conditioning	Textile Mills
Gas Plants	Heating and Ventilating	Laundries, etc.

Send for information on the type of apparatus in which you are interested.

HEAT TRANSFER PRODUCTS, INC.
A division of THE STATEN ISLAND SHIPBUILDING COMPANY, 90 West Street, New York

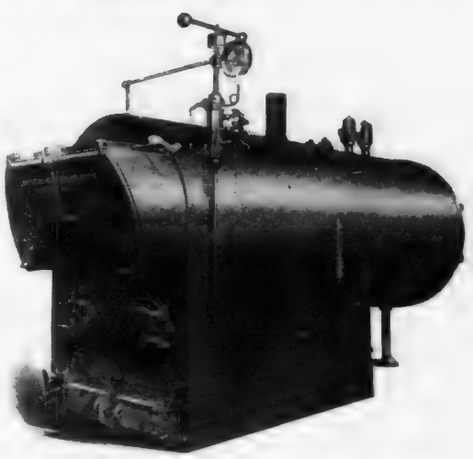


Chosen for the World's Largest Diesel Driven Yacht

The "SAVARONA" the palatial $2,000,000 Yacht built for Mr. Richard M. Cadwalader, Jr., of Phila., Pa., by the Pusey & Jones Co., of Wilmington, Del., and designed by Henry J. Gielow, Inc., New York City, is heated by a COATESVILLE BOILER. We like to feel that the selection of a COATESVILLE BOILER for such an important installation (where only the best will do) is a tribute to COATESVILLE Economy, Efficiency and Reliability.

We'd be glad to tell you of many other important Ships and Industrial Installations for which Coatesvilles have been chosen.

"THERE MUST BE A REASON"



At right, Coatesville All-Steel Portable Firebox Heating Boiler. These Boilers are available in Riveted or Welded and Riveted Types,—for steam pressures from 15 lbs. to 100 lbs. Ask for Bulletins Nos. 57 and 62.

COATESVILLE BOILER WORKS

Boilers - Tanks - Steel Plate Work

Main Office and Works—COATESVILLE, PA.

Philadelphia	New York	Boston	Pittsburgh	Baltimore
111 S. 15th St.	30 Church St.	141 Milk St.	Union Trust Bldg.	Lexington Bldg.

Plan Ahead with Scale Free Pipe -made to resist corrosion

THE high order of service expected from equipment in a building of today will not be made easier in the years to come. On the contrary, the demand will be more exacting. Particularly is this true of the service to be given by the pipe lines. Pipe must be installed that is made especially to resist corrosive influences.

Scale Free Pipe is a rust-resisting pipe and is the best assurance for long life and satisfactory service, especially in districts where the water is quite corrosive. Mill-scale is one of the principal causes of corrosion, particularly pitting; it is electronegative to the pipe metal and sets up galvanic action causing pitting around the scale areas—therefore, when scale is removed, longer life is obtained from the pipe. "NATIONAL" Pipe, butt-weld sizes ½ to 3-inch, is made by a scale-removing process. This is a patented process and applied exclusively to "NATIONAL" Pipe.

We will be glad to send Bulletin No. 7, which explains the advantages of the Scale Free Process. Also Bulletin No. 19—"NATIONAL" Pipe for Plumbing and Heating.

NATIONAL TUBE COMPANY

Frick Building, Pittsburgh, Pa.

For Oil Burner Installations—

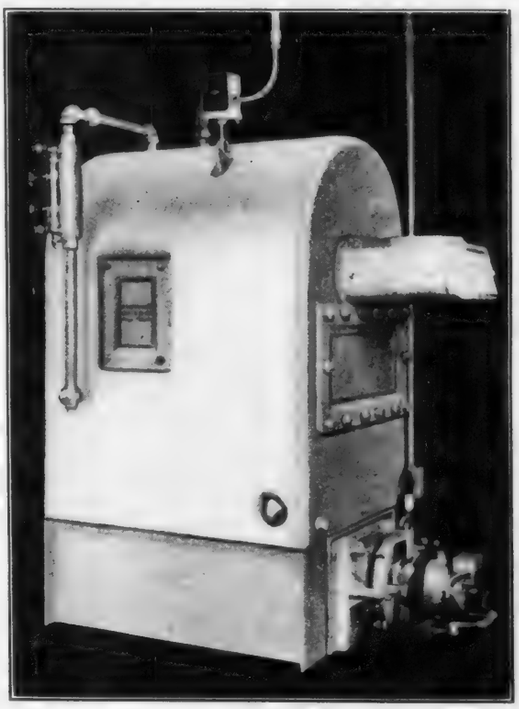
KNOWLTON "WATERTOOB" STEEL BOILERS

Give Complete Heating Satisfaction

Coal—Oil—Gas

THE KNOWLTON WATERTOOB STEEL BOILER is highly efficient with oil burners. Here temperatures are higher than where coal is burned, requiring a boiler not subject to temperature stresses and one in which the heat will be absorbed before the gases reach the chimney.

THE KNOWLTON is a water-tube boiler with a shell built of copper-bearing steel electrically welded. The tubes are arsenical copper long known as an admirable and long-lived material for this purpose. The heat-transfer ability of copper is also well known. The design provides long gas travel with definite and rapid water circulation.



The Knowlton "Watertoob" Steel Boiler equipped with an Oil Burner

THE KNOWLTON will operate most economically and equally well with oil, gas or coal fuels, but to get the most out of oil—specify the KNOWLTON.

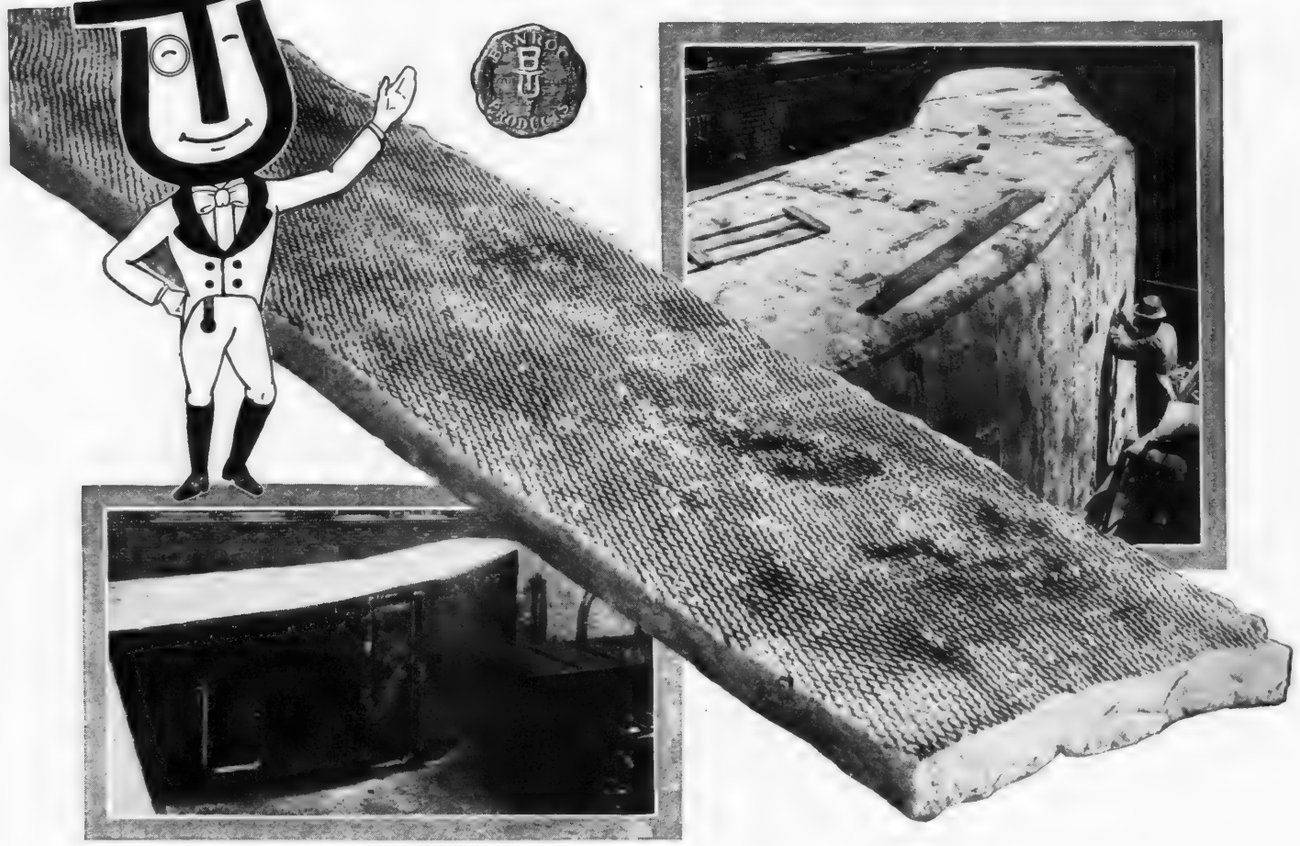
Write for booklet "Complete Heating Satisfaction" which tells the rest of the KNOWLTON story

ORR & SEMBOWER, Inc., Reading, Pennsylvania

(Established Since 1885)

208 N. Clinton St., CHICAGO :: 50 Church St., NEW YORK

Mr. B.T.U. Says: "Insulate *Forever* with BANROC



Banroc Meets Every Insulation Need

The "before and after" photo above shows a ventilating duct on one of California's finest theatres, which is insulated with BANROC *Jacket.*

Write for full particulars

There is scarcely an insulation need that cannot be efficiently and economically met by BANROC. From the walls of the home to the protection of high pressure steam lines — from domestic furnaces to the heating systems of mammoth buildings, BANROC insulation curbs the loss of heat with unequalled efficiency.

For years, industry has proclaimed this remarkable material the "Perfect insulation." The U. S. Bureau of Standards gives it the highest efficiency rating of any commercial insulation known.

Get acquainted with this line of BANROC PRODUCTS. Send for our new booklet, which briefly tells why they are "Better Investments."

ORIGINATORS
OF ROCK WOOL
PRODUCTS

SEND for THIS NEW BOOKLET TO-DAY

BANNER ROCK PRODUCTS CO.
ALEXANDRIA, INDIANA

INSULATION

AMERICAN STANDARDS
FOR
CAST IRON PIPE FLANGES AND FLANGED FITTINGS
DEVELOPED UNDER THE PROCEDURE OF
THE AMERICAN ENGINEERING STANDARDS COMMITTEE

EFFECTIVE NOW

125 LBS. SIZES	DIAMETER OF FLANGE	THICKNESS OF FLANGE	DIAMETER OF BOLT CIRCLE	NUMBER OF BOLTS	DIAMETER OF BOLTS	DIAMETER OF BOLT HOLES
	ALL DIMENSIONS GIVEN IN INCHES					
1	**4 1/4**	7/16	**3 1/8**	4	**1/2**	**5/8**
1 1/4	**4 5/8**	1/2	**3 1/2**	4	**1/2**	**5/8**
1 1/2	5	9/16	3 7/8	4	1/2	5/8
2	6	5/8	4 3/4	4	5/8	3/4
2 1/2	7	11/16	5 1/2	4	5/8	3/4
3	7 1/2	3/4	6	4	5/8	3/4
*3 1/2	8 1/2	13/16	7	*8	5/8	3/4
4	9	15/16	7 1/2	8	5/8	3/4
5	10	15/16	8 1/2	8	3/4	7/8
6	11	1	9 1/2	8	3/4	7/8
8	13 1/2	1 1/8	11 3/4	8	3/4	7/8
10	16	1 3/16	14 1/4	12	7/8	1
12	19	1 1/4	17	12	7/8	1
14 O.D.	21	1 3/8	18 3/4	12	1	1 1/8
16 O.D.	23 1/2	1 7/16	21 1/4	16	1	1 1/8
18 O.D.	25	1 9/16	22 3/4	16	1 1/8	1 1/4
20 O.D.	27 1/2	1 11/16	25	20	1 1/8	1 1/4
24 O.D.	32	1 7/8	29 1/2	20	1 1/4	1 3/8
30 O.D.	38 3/4	2 1/8	36	28	**1 1/4**	**1 3/8**
36 O.D.	46	2 3/8	42 3/4	32	1 1/2	1 5/8
42 O.D.	53	2 5/8	49 1/2	36	**1 1/2**	**1 5/8**
48 O.D.	59 1/2	2 3/4	56	44	**1 1/2**	**1 5/8**
54 O.D.	66 1/4	3	62 3/4	44	1 3/4	**2**
60 O.D.	73	3 1/8	69 1/4	52	1 3/4	**2**
72 O.D.	86 1/2	3 1/2	82 1/2	60	**1 3/4**	2
84 O.D.	99 3/4	3 7/8	95 1/2	64	2	**2 1/4**
96 O.D.	113 1/4	4 1/4	108 1/2	68	2 1/4	**2 1/2**

EFFECTIVE NOW

250 LBS. SIZES	DIAMETER OF FLANGE	THICKNESS OF FLANGE	DIAMETER OF BOLT CIRCLE	NUMBER OF BOLTS	DIAMETER OF BOLTS	DIAMETER OF BOLT HOLES
	ALL DIMENSIONS GIVEN IN INCHES					
1	**4 7/8**	11/16	**3 1/2**	4	**5/8**	**3/4**
1 1/4	**5 1/4**	3/4	**3 7/8**	4	**5/8**	**3/4**
1 1/2	**6 1/8**	13/16	4 1/2	4	**3/4**	**7/8**
*2	6 1/2	7/8	5	*8	5/8	3/4
*2 1/2	7 1/2	1	5 7/8	*8	3/4	7/8
3	8 1/4	1 1/8	6 5/8	8	3/4	7/8
3 1/2	9	1 3/16	7 1/4	8	3/4	7/8
4	10	1 1/4	7 7/8	8	3/4	7/8
5	11	1 3/8	9 1/4	8	3/4	7/8
6	12 1/2	1 7/16	10 5/8	12	3/4	7/8
8	15	1 5/8	13	12	7/8	1
10	17 1/2	1 7/8	15 1/4	16	1	1 1/8
12	20 1/2	2	17 3/4	16	1 1/8	1 1/4
14 O.D.	23	2 1/8	20 1/4	20	1 1/8	1 1/4
16 O.D.	25 1/2	2 1/4	22 1/2	20	1 1/4	1 3/8
18 O.D.	28	2 3/8	24 3/4	24	1 1/4	1 3/8
20 O.D.	30 1/2	2 1/2	27	24	**1 1/4**	**1 3/8**
24 O.D.	36	2 3/4	32	24	**1 1/2**	**1 5/8**
30 O.D.	43	3	39 1/4	28	1 3/4	**2**
36 O.D.	50	3 3/8	46	32	**2**	**2 1/4**
42 O.D.	57	3 11/16	52 3/4	36	**2**	**2 1/4**
48 O.D.	65	4	60 3/4	40	2	**2 1/4**

Bold type indicates differences between this standard and 1914 Cast Iron Standard.
Asterisks indicate fittings which can *not* be bolted to fittings drilled to 1914 Standard.
Sizes shown in bold type without asterisk can be bolted to 1914 Standard drillings.

The Manufacturers Standardization Society of the Valve and Fitting Industry has adopted January 1, 1928, as the date on and after which material will be furnished to the above dimensions unless otherwise specified.

WALWORTH

Walworth Company, General Sales Offices: 51 East 42nd St., New York.
Plants at Boston, Mass.; Kewanee, Ill.; Greensburg, Pa., and Attalla, Ala.

Distributors in Principal Cities of the World
Walworth Co., Limited, 10 Cathcart St., Montreal, P. Q.
Walworth International Co., New York, Foreign Representative

Results Count!

A Letter from One Qualified to Speak

WESTERN RESERVE UNIVERSITY
CLEVELAND, OHIO

CHARLES E. WALSH
Chief Engineer

December 15, 1927

The Ric-Wil Company
Cleveland, Ohio

Gentlemen:

During the summer of 1926 we installed 530 feet of 15", Type F Ric-Wil conduit enclosing six inch low pressure steam line and a three inch return line. The total cost of the installation was approximately $3,500. Installing these pipes underground from our main power house eliminated the use of four boilers which had been used to heat a group of twelve buildings located at Adelbert College of Western Reserve University.

Last season we figured that during the preceding heating season we had effected a saving of approximately two thirds of the total cost of making this change in the method of heating these outlying buildings. Some of this saving was no doubt due to increased boiler efficiency, but certainly no small part of our saving is due to the efficiency of our underground distributing system.

Our Ric-Wil materials were received in excellent condition and the installation was made in a remarkably short time. The fact that all field engineering has been reduced to a minimum has made it possible to install the materials ourselves, and we feel that our installation is as efficient as it is possible to have it at the present time.

Very truly yours,

C. E. Walsh

CEW/AM

Chief Engineer.

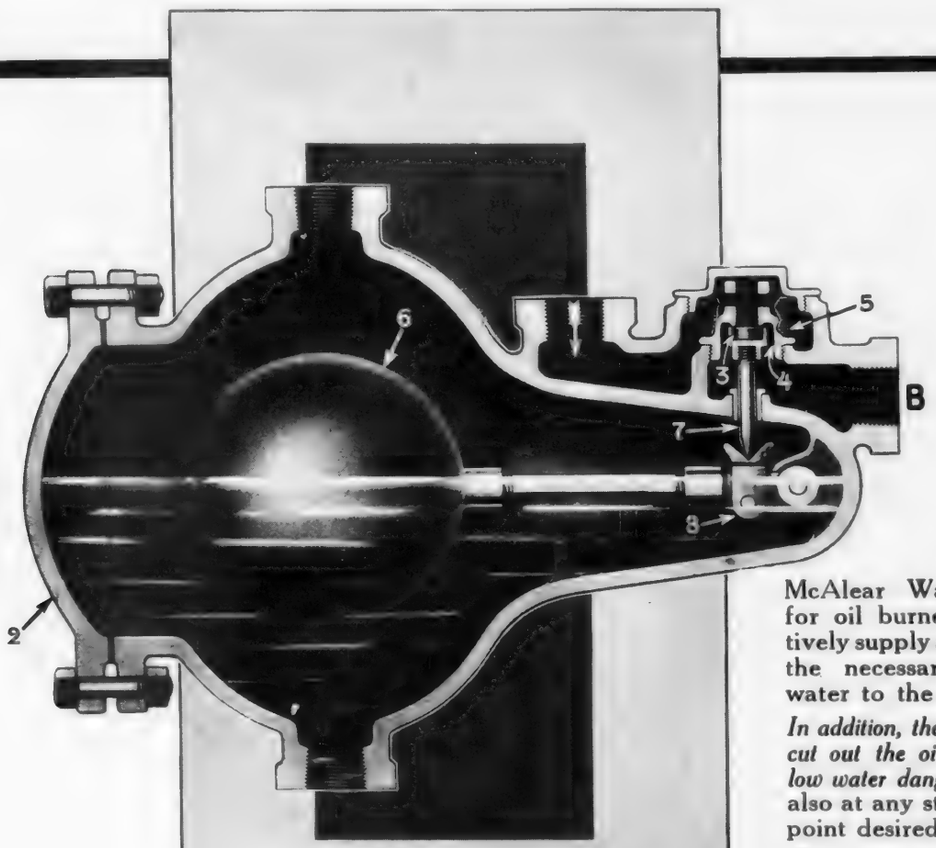
Be sure to get A Ric-wiL Proposal and Estimate on your Next Job

The Ric-wiL Company

Originators of Waterproof Conduit Filter

1567 Union Trust Bldg., Cleveland, O.

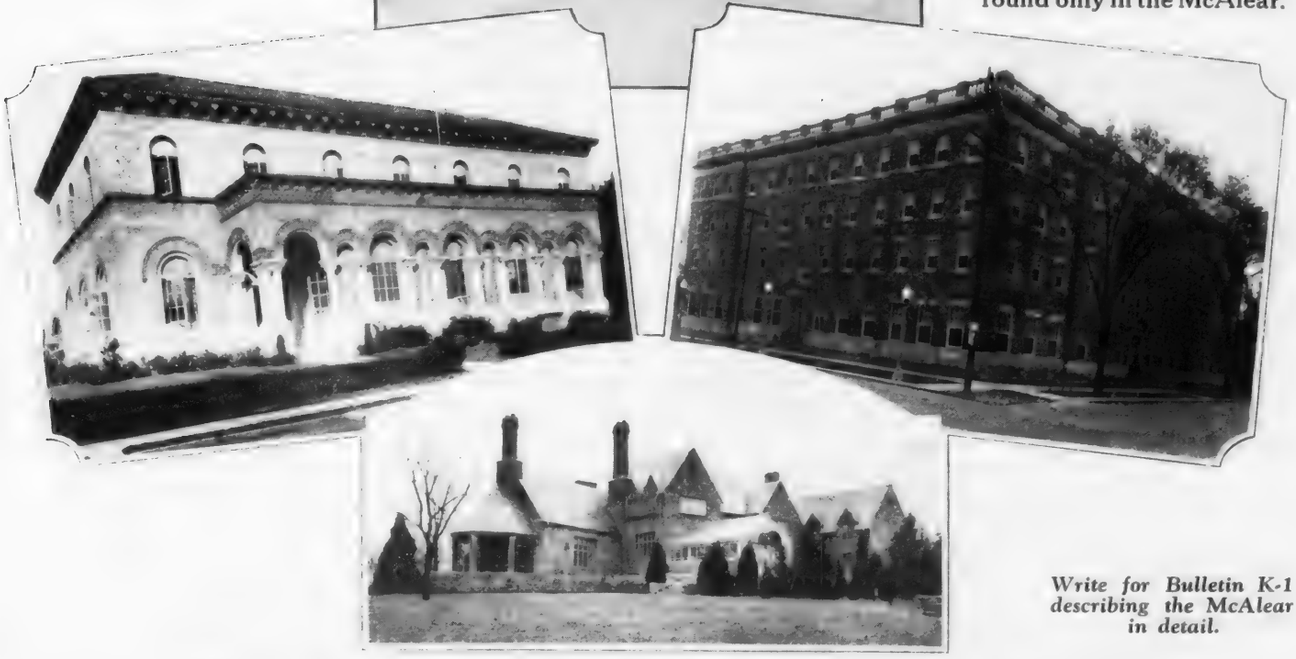
Offices in Principal Cities



McAlear Water Feeders for oil burners will positively supply automatically the necessary make-up water to the boiler.

In addition, the McAlear will cut out the oil burner at the low water danger point, and also at any steam pressure point desired.

This *double* protection is found only in the McAlear.



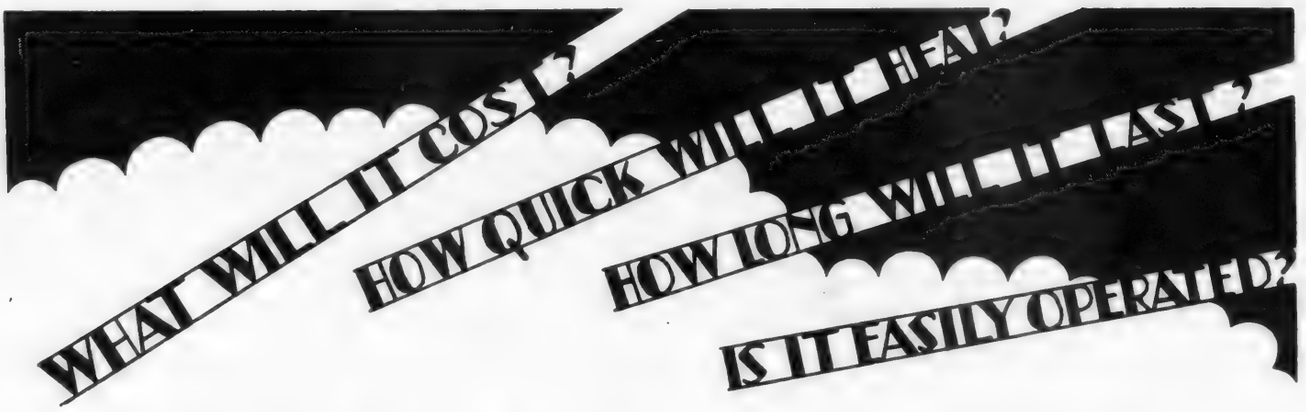
Write for Bulletin K-1 describing the McAlear in detail.

Boilers in these buildings—and countless others throughout the country—are fully protected by McAlear Water Feeders. The McAlear operates with unvarying success on oil, gas and coal fired boilers.

19th and Western

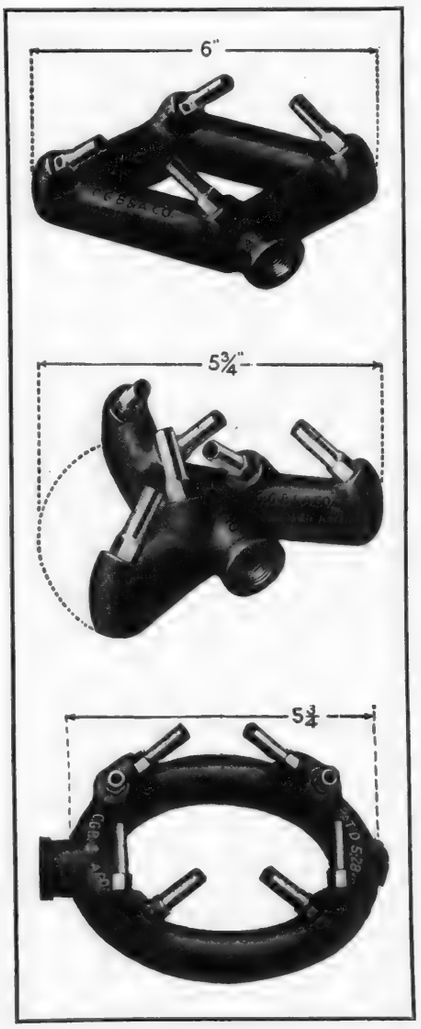
McALEAR
Manufacturing Company

Chicago, Illinois



All of Your Customer's Questions

ANSWERED BEST BY BARBER BURNER EQUIPPED WATER HEATERS



You know the questions that purchasers of hot water heaters ask.

"What will it cost?" is one of them. If you're handling a Barber Patented Jet Gas Burner, you can always guarantee your customers a saving of from 15% to 35%.

"How quick will it heat?" This question, too, is easily answered by all Barber Burner equipped heaters. Barber Burners develop 1960 deg. Fahr. with 500 B.T.U. gas. They produce an orange green flame with artificial, natural or mixed gases.

"How long will it last?" Here, you have the big advantage again, for, manufacturers of water heaters who are particular enough to select Barber Patented Jet Gas Burners for their products can also be depended upon to build a long-lived heater throughout.

"Is it easily operated?" The Barber Burner can be controlled with any good thermostat, acts as its own pilot light, requires no adjustment, regardless of pressures or quality of gas—nothing could be simpler.

All of the products of the manufacturers listed at the right use Barber Burners.

Write us for complete information

Among the many Manufacturers who have adopted Barber Patented Jet Gas Burners as Standard in their Hot Water Heaters, Boilers and Appliances, are the following:

Akron Equipment Company
American Radiator Company
Armbruster & Betlem
Bastian-Morley Co.
Bean Spray Pump Co.
Bryan Steam Corp.
Carrier Construction Co., Inc.
Coast Heater Mfg. Co.
Champion Dish Washing Machine Co.
Day & Night Water Heater Co.
Detroit Range Boiler Co.
Economy Heater Co.
The Electro Weld Co.
R. E. Fraser & Co.
Firestone Tire & Rubber Co.
Franklin Plumbing Supply Co.
Geneva Heater Co.
Gewert Mfg. Co.
E. A. Hibbs
Hoffman Heater Co.
Hollywood Water Heater Co.
Hotstream Heater Co.
Hoyt Heater Co.
Edward Katzinger Co.
John Trageser Steam Copper Works
Lovekin Water Heater Co.
Marlow Manufacturing Co.
McCann-Harrison Co.
Walter Mork
Merit Mfg. Co.
Newell Mfg. Co.
New Way Mfg. Co.
Northwestern Steel & Iron Works
Geo. F. Reichman & Co.
Safety Water Heater Co.
Sands Mfg. Co.
Schwab Boiler & Machine Co.
Snap-O-Stat Co.
Stinson Sales Co., Inc.
United Heater Corp.
Vernon Edler Corp.
F. C. Barton Co.
D. D. Wessels & Sons Co.
The Wise Furnace Co.
Welsbach Company
The Williams Foundry Machine Co.

The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3702-04 Superior Avenue, Cleveland, Ohio

No Leaks can develop in this steam line

THIS welded underground steam main is made entirely free to expand and contract by welding in BADGER SELF-EQUALIZING EXPANSION JOINTS, that cannot leak.

The one-piece expansion element is made from a copper tube, which is deeply corrugated by a special process. External equalizing rings are fitted between the corrugations to distribute the movement uniformly throughout the element. There are no sliding members, stuffing boxes or packing to contend with.

The pipe line is properly anchored and guided by means of standard Badger Pipe Guide Fittings that are bedded in concrete blocks. Anchorage is secured by welding lugs on each side of the strap.

Guaranteed for all working pressures to 200 lbs. *Write us now for Bulletin.*

BADGER ENGINEERING SERVICE

Badger engineers are designers, manufacturers and installation experts for the following and kindred power plant products: Pipe Bends, Chemical Apparatus, Copper and Sheet Metal Work, Copper Boilers.

E. B. BADGER & SONS CO.

75 Pitts St., BOSTON, MASS.

New York: 271 Madison Ave.

Representatives in all principal cities

Tulsa, Okla.: Mid-Continent Bldg.

BADGER EXPANSION JOINTS

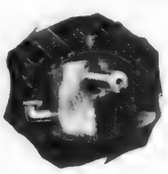
ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · E. B. BADGER & SONS COMPANY · TRADE MARK

¾ Horse Power Century Type SC
Squirrel Cage Induction 3 and 2 Phase Motor

Century

Wool-Yarn System of Lubrication

At least one year's continuous 24-hour-per-day operation, *without reoiling*, is assured in Century 1 Horse Power and smaller Squirrel Cage Induction 3 and 2 Phase Motors . . . They are equipped with the Century Wool-yarn System of Lubrication, consisting of only continuous, unbroken strands of pure wool yarn . . . the highest grade of material available. Oil is conserved indefinitely, and leakage tendencies are eliminated, because there is no drain plug in the bottom of the oil well . . . Century Type SC Squirrel Cage Induction 3 and 2 Phase Motors are built in standard sizes from ¼ to 75 horse power.



The continuous, unbroken strands of pure wool yarn completely filter all oil before delivery to the bearing surfaces, protecting them against abrasive wear.

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.

33 Stock Points in the United States and More Than 50 Outside Thereof

Century MOTORS

"THEY KEEP A-RUNNING"

The Three Steps to Perfect Radiation

ROBRAS 20-20 RADIATORS

In the Walls—Under the Window Out Of The Way

It is really very simple to install a radiator where it will be out of the way. A recess, as shown to the left in the above illustration, is left by mason and carpenter when they finish their part of the work.

You line the recess with galvanized iron. Then you connect up the Robras 20-20 radiator. The sections of this radiator have been assembled at the factory in the lengths and amount of radiation you require. It is ready for you to attach to the existing heat whether it be hot water, steam or vapor.

After the radiator has been set up, a front is fitted on. This is equipped with two grilles, as simple or elaborate as the pocketbook of your customer permits. Then the job is finished. The room has bountiful warmth and there is no radiator in sight or in the way. The air is thrown out into the room where it can't soil the curtains. The valve handle is extended to the window sill, giving easy control. These Robras 20-20's are the height of radiator luxury.

ROME BRASS RADIATOR CORPORATION

ONE EAST FORTY-SECOND STREET . . . . . NEW YORK

Will Pop's taste change?

"Here, Lad—

I don't want to change to the arc-welding method of making our breeching and expansion joints. My taste is for the good old riveted production and, after all, life is a matter of taste."

"Yes, Pop—

but in **business** life it's the **other fellow's** taste that's to be considered or your business won't have any life.

Manufacturing brains have been developed in all our plants—but our **merchandising** brains haven't yet begun to unfold, and that's necessary in today's market.

Buyers of heating and ventilating equipment know by this time that the best and strongest and neatest jobs are produced by 'Stable-Arc' welding in the up-and-coming factories—**and at lowered cost.**

That's why manufacturing merchandisers are giving them what they want.

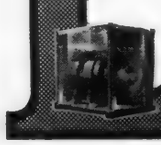
Didn't you see all the arc-welded equipment at the Power Show?

Life after all **isn't** just a matter of **taste.**

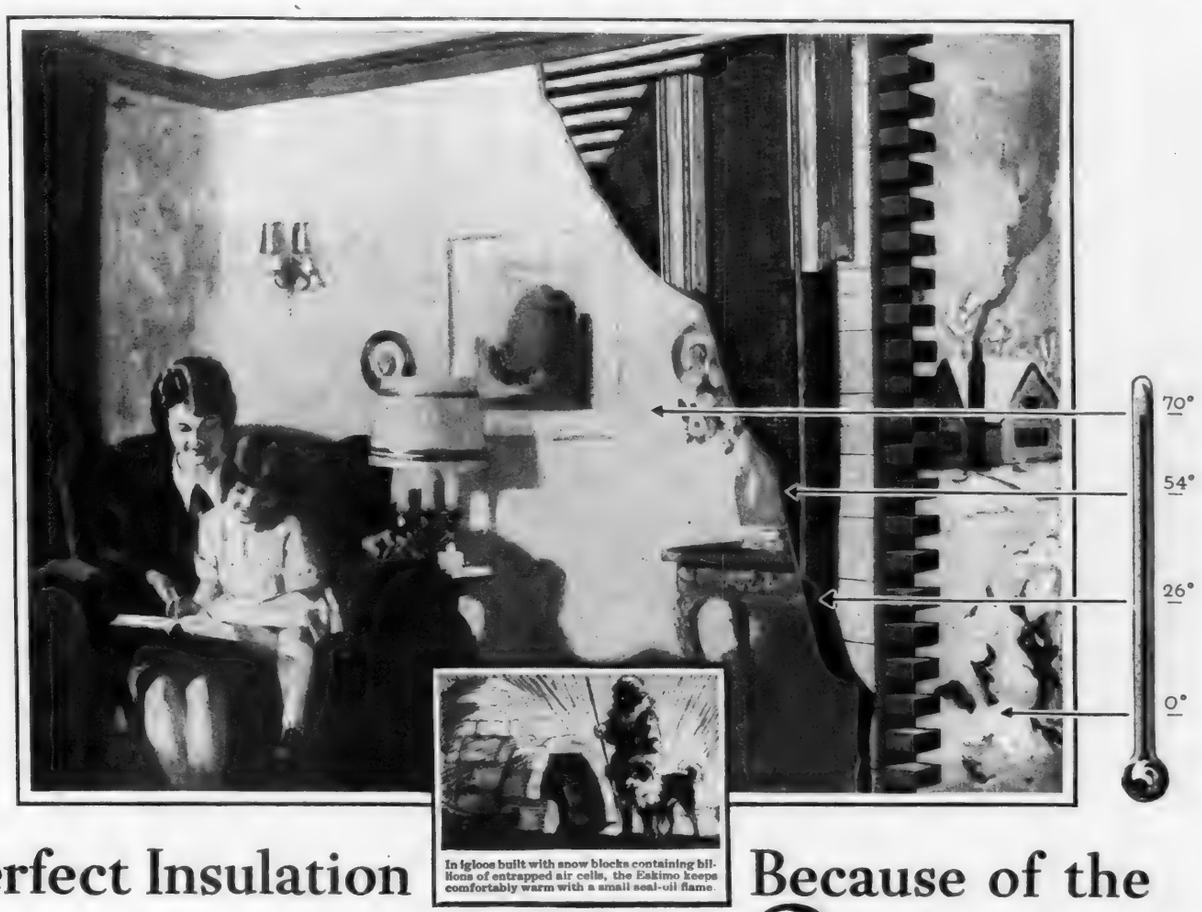
It's also SEEING what competition is doing.
It's also FEELING what the public wants.
It's also HEARING what big production men say.
But chiefly it's SMELLING a rat when people don't buy your stuff."

The Lincoln Electric Co., Dept. No. 16-3, Cleveland, Ohio

W-88



"Stable-Arc" LINCOLN WELDER



In igloos built with snow blocks containing billions of entrapped air cells, the Eskimo keeps comfortably warm with a small seal-oil flame.

Perfect Insulation Because of the Natural Principle of Utilizing 2 *air spaces*

ZERO outside—70 degrees inside—*and the heating plant not being forced!*

You can have such comfort and economy *with the least amount of thermal insulation,* only when *two air spaces* are created within the wall.

Tests by the U. S. Bureau of Standards show that ½-inch insulation, applied to divide the wall into two air spaces, is equal to ¾-inch thickness used as a plaster base or in contact with the sheathing.

Bear in mind that ½-inch is the economical thickness for wall insulation. When ½-inch wall insulation is so installed that it does not form two air spaces—*then you must use ¾-inch material to secure the same comfort and economy.*

Flanged FLAX-LI-NUM was created to fit the 2 air space method. Its ½-inch sheets are delivered to the job, ready to install between the studs. They go in easily, quickly, correctly and without waste.

The 1-inch sheets, for your roof, give you the correct thickness in one piece, simplifying the installation and reducing handling costs.

Get the facts! See how and why the 2 air space method is the scientific principle of thermal insulation. Mail the coupon *now.*

Flax-li-num is Made from Purified Flax

FLAX-LI-NUM is made from flax—the same material used to make linen—a material selected solely for its superior thermal insulating qualities. It is not a low-cost by-product, adapted to thermal insulation.

The facts about thermal insulation are of prime importance to you. Mail the coupon—*and get them.*

FLAX-LI-NUM INSULATING CO., ST. PAUL, MINN.

Flax-li-num

THE CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL

FLAX-LI-NUM INSULATING CO.
St. Paul, Minn.

Send me results of U. S. Bureau of Standards tests of 2 *air space* method of insulation. Also send full details about Flax-li-num.

Name..... Address..... City..... State..... H. V.--1

Our Contribution
to the art of Heating & Ventilation

FIVE YEARS AGO when the Herman Nelson light weight, compact, indestructible radiator was placed on the market, it was immediately accepted as the greatest advance in the art of Heating and Ventilation in a generation. It has made possible heating and ventilation dependability and performance hitherto unattainable.

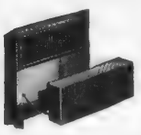
The Herman Nelson Wedge Core Radiator is an exclusive feature of all Herman Nelson Heating and Ventilating Products and accounts for their unequaled performance.

HEATING ∿ VENTILATING ∿ COOLING ∿ DRYING ∿ CONDENSING

UNIVENT

for the ventilation of schools, hospitals, offices and other buildings presenting an acute ventilating problem.

HERMAN NELSON *Invisible* RADIATOR

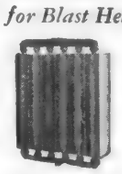


... supersedes all previous radiators, radiator cabinets or enclosures. Occupies no room space and makes possible any desired decorative scheme or furniture arrangement. Indestructible in service.

THE HERMAN NELSON hiJet UNIT HEATER

It operates at steam pressures from 1 to 150 lbs., and offers the better and more economical way of diffusing heat in Factories, Railroad Shops, Roundhouses, Mills, Warehouses, Garages, Gymnasiums and Industrial Buildings.

Herman Nelson Radiator Sections
for Blast Heating and Cooling



Indestructible, operating at any steam pressure from 1 to 150 lbs., non-corrosive and leak-proof.

May be arranged in banks to solve any special problem of heating or cooling.

THE HERMAN NELSON CORPORATION ∿ *Moline, Illinois*

Builders of Successful Heating and Ventilating Equipment for over 20 Years

Sales and Service

BELFAST, ME.	UTICA	SCRANTON	SAGINAW	CINCINNATI	DES MOINES	ST. LOUIS	DALLAS	SALT LAKE CITY	SAN FRANCISCO
BOSTON	BUFFALO	PITTSBURGH	DETROIT	TOLEDO	MILWAUKEE	BIRMINGHAM	EMPORIA	SPOKANE	VANCOUVER
NEW HAVEN	PHILADELPHIA	CHARLOTTE, N. C.	CLEVELAND	INDIANAPOLIS	GREEN BAY	ATLANTA	KANSAS CITY	PORTLAND	TORONTO
NEW YORK CITY	WASHINGTON, D.C.	GRAND RAPIDS	COLUMBUS	CHICAGO	MINNEAPOLIS	MEMPHIS	DENVER	SEATTLE	WINNIPEG, MAN.

This Folder ' ' *In Your* Files

is something for which you will have frequent use. It is a General Insulation Folder — contains a fund of helpful material compiled and prepared by insulation engineers— and will be of great service in figuring fuel savings and other problems relating to scientific insulation. Convenient in size and arrangement— easily accessible when filed.

INSULITE
the Wood-Fiber Insulating Board

THE INSULITE COMPANY
Builders Exchange
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Fill out the coupon or write us a letter or card and a copy of the folder will be sent immediately — without charge.

Please send a copy of your General Insulation Folder.

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TRANE EQUIPPED

Province of Ontario Parliament Buildings

M. F. Thomas, Toronto, Consulting Engineer. Purdy-Mansell, Ltd., Toronto, Heating Contractors. Provincial Architects Dept., Architects.

Trane specialties have earned a reputation which extends the world over. Here is a typical Canadian installation—a distinguished group of public buildings equipped with over two thousand units of Trane heating specialties.

Trane products are used the world over. Trane service is available through three dozen distributors and branch offices in the United States, Canada, England, Japan, and China. Ask for Bulletin 14.

THE TRANE COMPANY (Est. 1885), 206 Cameron Ave, La Crosse, Wis.

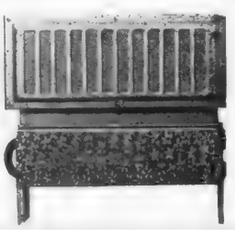
1125 *Trane Bellows Packless Valves*

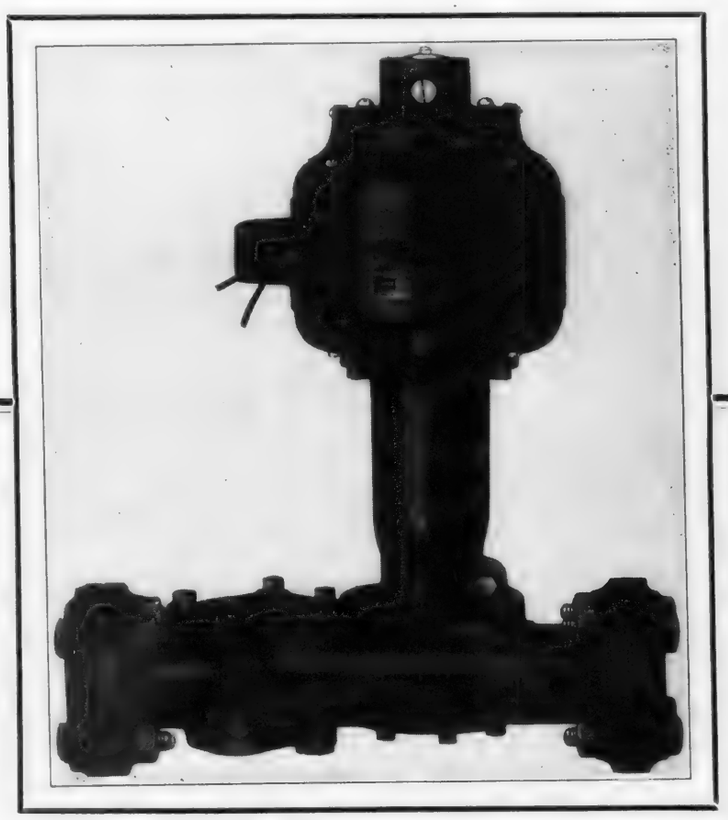
1160 *Trane Bellows Traps*

HEAT CABINETS **TRANE** CONCEALED HEATERS

▾▾▾ PUMPS AND HEATING SPECIALTIES ▾▾▾

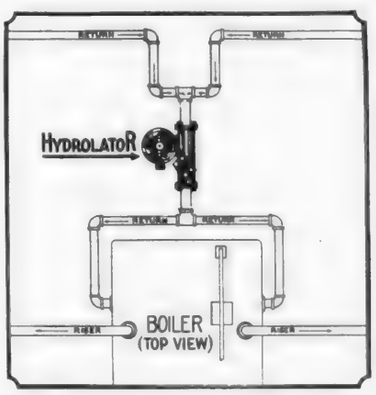
Bulletin 24, "How to Select and Install Trane Concealed Heaters," has met with an enthusiastic reception among heating men. If you have not seen this up-to-date, practical bulletin on "Successors to the Radiator," write at once for a copy.





Patent Applied For

Add "Greater Efficiency and Fuel Economy" To Your Arguments for Hot Water Systems



Pen drawing of HYDROLATOR installation showing a possible hook-up with two return lines. The HYDROLATOR is shown located behind the boiler in this illustration, but as this is not always possible its location on any system may easily be determined by the position of the boiler and pipes. HYDROLATOR is always mounted on the return line.

Greater efficiency and fuel economy than ever before are only two of the many new sales points which the HYDROLATOR has added to hot water heating systems. Merely by speeding up water circulation, the HYDROLATOR increases the heat-conducting efficiency of the water and makes possible a more economical and uniform distribution of heat. Practically eliminates any waste of heat caused by sluggish circulation.

Simplicity and sturdiness feature the design and construction of the HYDROLATOR. Electrically operated. Circulates the water several times faster than it would flow by ordinary thermo-syphon action. Forces water of even temperature to *every* radiator, regardless of whether the radiator is above, below, or on a level with, the boiler. Reasonable cost. Quickly pays for itself. Can be installed on either new or old systems.

Mail the Coupon for Sizes, Prices, Discounts and Complete Information

JANETTE MANUFACTURING COMPANY

556 West Monroe Street
CHICAGO, ILL.

Singer Bldg.,
149 Broadway,
NEW YORK CITY.

Real Estate
Trust Bldg.
PHILADELPHIA

HV-3

JANETTE MANUFACTURING CO.
556 W. Monroe St., Chicago, Ill.

Gentlemen: Please send me full information on the HYDROLATOR; including prices, sizes, discounts and installation.

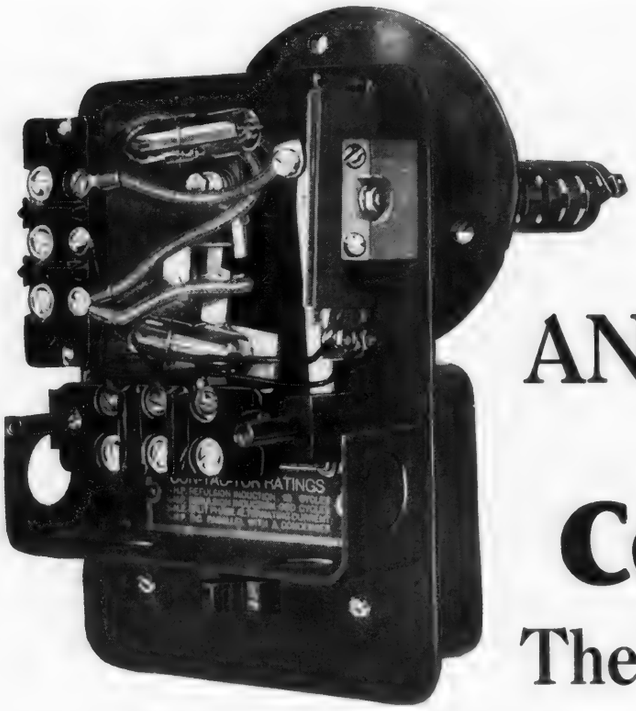
Name .....

Address .....

City..... State .....

My Plumbing
Supply Jobber .....

City..... State .....



ANOTHER IMPORTANT ANNOUNCEMENT

by

CON-TAC-TOR

The No. 123 Burner Boss

Con-Tac-Tor presents another complete burner control and safety in the Burner Boss System. The illustration shows the cut No. 123 Burner Boss, the heart of Con-Tac-Tor's latest achievement in simple, dependable and economical oil burner controls.

Embodying the proven principles of stack timed ignition and thermal safety, first developed and presented by Con-Tac-Tor engineers several years ago, and used in increasing quantities ever since, the Burner Boss provides full automatic operation and safety in a single stack mounted unit.

Its many outstanding advantages, ease of installation, complete dependability, low cost and ready adaptability can not successfully be described on paper. These points are fully appreciated only after a trial of it.

Send for a sample and try the Burner Boss on your Burner.

"1928 is a CON-TAC-TOR year"

ABSOLUTE CON-TAC-TOR CORP.
Elkhart, Indiana.

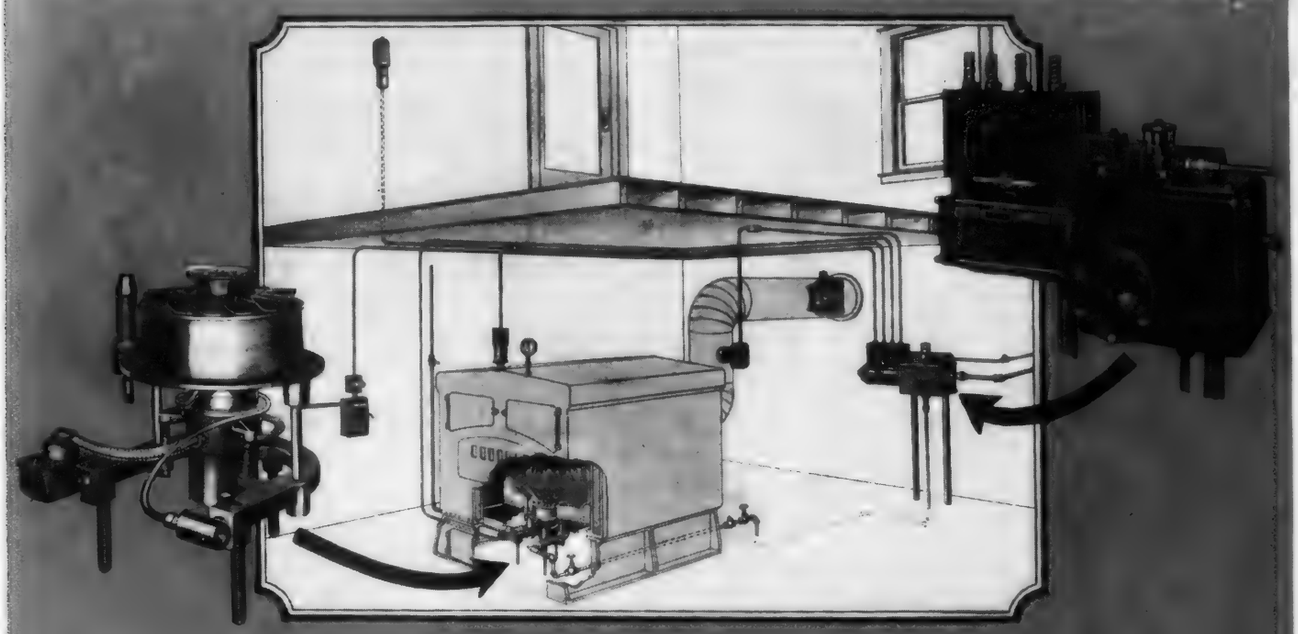
Please send me:
☐ Full Information and Prices.
☐ Test Sample of No. 123 BURNER BOSS.
We are ☐ Dealers ☐ Dist'rs ☐ Mfr's
of the.....BURNER
Signed .....
.....
HV 328

Features of the BURNER BOSS

A Single Stack Mounted Unit.
No Adjustments Necessary.
Independent of Motor Current and Frequency.
Can be used on either A.C. or D.C.
Only two models, one for 110 V and one for 220 V.
Stack timed intermittent ignition.
Thermal Safety.
Takes the controls off of the burner.
A combined safety and Stackswitch.

ABSOLUTE CON-TAC-TOR CORPORATION

ELKHART, INDIANA



Commonwealth Automatic Oil Burner

The COMMONWEALTH is a sturdy piece of apparatus embodying a simplicity of mechanism and as few working parts as are consistent with dependable performance and supremacy. It is compact and light and can be easily and quickly removed from the heating plant for periodical inspection. The G-E burner motor used on this job employs no brushes, commutator, ball bearings or oiling wicks, being especially adaptable for this particular kind of service. The three ring piston pump is identical in principle with those that have been in successful operation for over twenty years. The burner is built in one size and type, adjustable to all domestic plants.

COMMONWEALTH represents the experience of seven years brought up to date. During this period, installations have been confined to the Chicago district. This policy has been followed so that the burner could be developed under strict observation, to eliminate expensive field service, and to provide the necessary time to perfect factory arrangements that would not embarrass the dealer. Distributors who have investigated the COMMONWEALTH have been impressed with the high quality of the merchandise and the surprisingly low figure at which it is priced. We are now thoroughly prepared to expand our activities and, accordingly, will be pleased to discuss representations with reliable firms and individuals.

The COMMONWEALTH will be on exhibition at the Stevens Hotel, April 3-4-5, during the Annual Convention of Oil Burner Manufacturers. Distributors are invited to inspect this equipment, as well as to visit our factory and get acquainted with the personnel of our organization.

THE COMMONWEALTH ENGINEERING COMPANY

DIVISION *of* DRYING SYSTEMS, Inc.

1800 Foster Avenue CHICAGO, U. S. A.

SEE the burner that is bought on *proved performance*

You are invited to visit our experimental laboratory

There is a reason for low service cost on ABC. Nothing is left to chance. Heating and mechanical efficiency is not guessed at. Improvements are not tested at the expense of the dealer. Our laboratory—considered one of the best equipped in the industry—is ABC's proving ground and the dealers' guarantee of mechanical dependability.

The Modern

ABC Automatic Oil Burner

is being demonstrated at Booth 54

American Oil Burner Association Convention

A Quiz for oil burner buyers

Ask salesmen these questions

Has your burner a fan or blower?
ABC has no fan or blower. It saves fuel.

Does your burner burn the oil in suspension?
If oil burns in contact with the heating surface of a boiler (regardless of the fancy term used to describe that contact) the result is carbon and wasted fuel.

How many moving parts has your burner?
The number of moving parts a machine has determines how much service it will require and how long it will last.
ABC has only one moving part.

How long has your burner been made?
Since 1921 ABC has been economically heating homes.

Is your burner out of the experimental stage?
Mechanical products are conceived in factories, developed to meet conditions that are ideal—and broken in the field of practical use. This is unfortunate, but true. Even simple, mechanical faults, or "bugs" are discovered only after several years' use under varying conditions.

How do you know?
Time alone tears the mask from mechanical defects—and passes on. But man must make the corrections, and refinements. Is he properly equipped?
In the oil-burner industry, ABC's experimental laboratory is said to be one of the best. Nothing is left to guess. Delicate instruments are the safeguard to the efficiency of ABC burners.

Is your burner a side line?
An oil-burner is a highly specialized device. Oil combustion is a science in itself. To make a good oil burner it requires more than capital, more than prestige earned in the successful manufacture of some unrelated product. It requires knowledge. And men who know oil combustion are rare.
Since 1921 the Automatic Burner Corporation has been making but one product—the ABC Oil Burners. Its life depends entirely on the successful operation of ABC.

Is your burner quiet?
ABC has always been quiet. It leaves to you the pleasure of introducing it to your guests.

Has your burner a high-speed motor?
The ABC motor revolves at the rate of ten thousand revolutions a minute and brings about minute atomization which results in good combustion and lower oil consumption.

Is your burner enclosed in the boiler?
ABC is enclosed in the boiler—where it should be. There is no cumbersome machinery projecting from the heating plant. ABC is out of sight—and out of the way.

What type of flame has your burner?
The ABC flame is circular. It heats from the grate level—the only place your boiler was designed to receive heat. A flame applied in any other manner is a violation of the intended function of your heating plant.

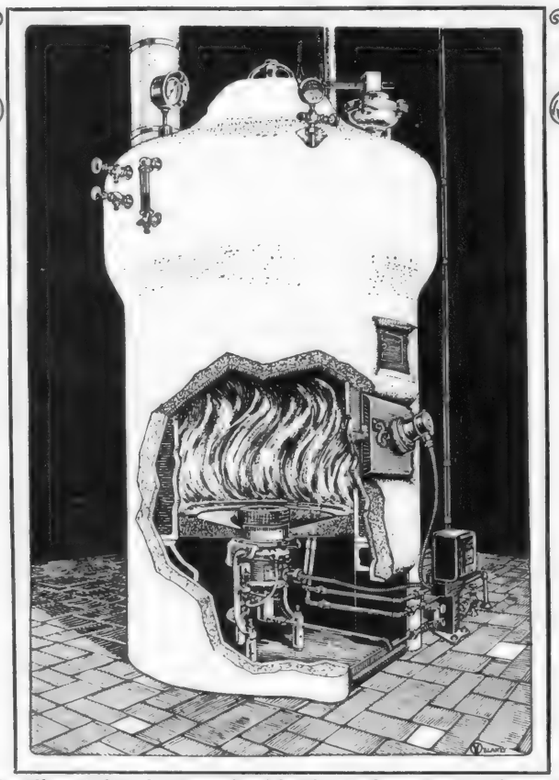
Is the flame concentrated on a small portion of the boiler?
A concentrated flame is like a six-cylinder automobile hitting on only one cylinder. All of the heat-absorbing surface of your boiler must be used if you are to receive quick, economical heat.
The ABC circular flame fills the entire firebox. Gently, the heat is distributed all around the boiler—in suspension.

AUTOMATIC BURNER CORPORATION

312 North May Street, Chicago.

See us at booths 119 and 120 at the American Oil Burners Association Convention—April 3rd, 4th, 5th.

ENJOYABLE
as your radio



NOISELESS
as a cat's tread

Toridheet is listed as standard by the Underwriters' Laboratories

Profit is Sure if You Sell Satisfaction

There is no business today that offers such marvellous money-making opportunities as that of selling oil burners. Coal burning is a thing of the past. This cannot be denied. Oil is the modern heat. But to make profit and keep the profit you make, you must sell a burner that will give unlimited satisfaction, one that will not eat up your earnings with excessive service calls. Such a burner is the supremely good and positively proved—

$385.00
With operating and safety controls

TORIDHEET
OIL BURNER
FOR BETTER HOME HEATING

$385.00
Installation costs vary with tankage capacity desired

The Toridheet affords complete satisfaction to owner and dealer alike

In design, operating principle and construction it is correct. It is built by a financially-strong old-line concern, specialists in precision machine work. It has been thoroughly tested and proved before being placed upon the market. It is easily and quickly installed in any standard type heater or furnace. It is noiseless, economical, clean, super-safe, fully automatic, low in price. And it may be depended upon to give uninterrupted service.

Toridheet is a burner that is attractive to the better type of dealer, the man interested in establishing himself in a profitable, permanent business. If you wish to join a group of progressive and successful dealers, write us without delay. We will gladly give you full details of our proposition and complete facts about this remarkable burner.

CLEVELAND STEEL PRODUCTS CORPORATION
Madison at West 74th Street . . . *Cleveland, Ohio*

Petro's Leadership

is based on 5 years' perfect record

A Petro for every boiler from 200 sq. ft. to 1000 h.p.

FOR 25 years the Petroleum Heat & Power Co. has specialized in industrial oil heating. Today thousands of such skyscrapers as the Equitable Building in New York City depend upon Petro for heat and power.

Six years ago this same genius was turned to a domestic Petro Oil Burner. The following year Petro engineers had developed an oil burner unequalled by anything then being marketed. But being engineers, there was no flourish of full page ads. Instead there were four more years of closer observation as the number of installations reached the thousands.

History has proved that once a Petro goes in, **it never comes out!** It is the most remarkable record in the whole history of oil heating. Now these engineers are willing to concede that they have the greatest oil burner ever built.

Using 24 gravity fuel oil, the lowest ever listed by the Underwriters, the following is the range of the four domestic Petro Oil Burners.

LD-0 Petro—
200 sq. ft. of steam radiation to 1000.

LD-1 Petro—
800 sq. ft. of steam radiation to 3000.

LD-2 Petro—
1800 sq. ft. of steam radiation to 6000.

LD-3 Petro—
5000 sq. ft. of steam radiation to 18,000.

Full details of how this record was accomplished and the revolutionary developments in the Petro will be mailed to any organization of the character to represent the leader of the industry. See Petro at the show!

PETROLEUM HEAT & POWER CO.
Makers of oil burners since 1903.
511 Fifth Ave., New York City.

PETRO
REG. U.S. PAT. OFF
Domestic and Industrial Oil Burners.

SELL *the* Sundstrand

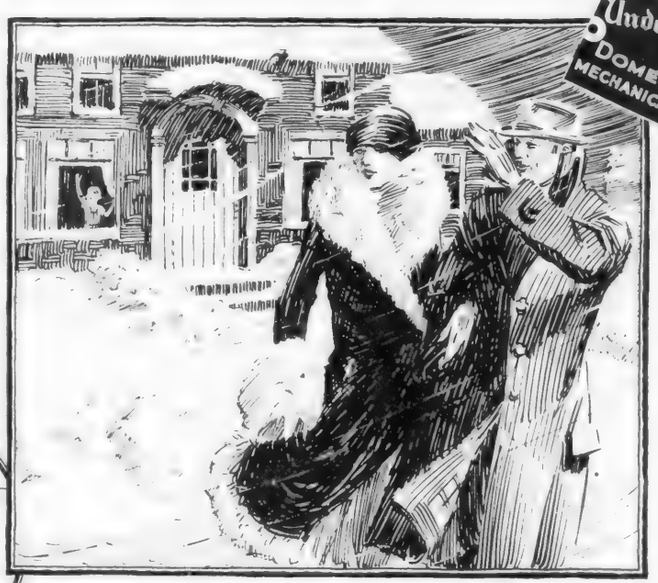
for Dependable, Automatic Warmth WITH UTMOST SAFETY

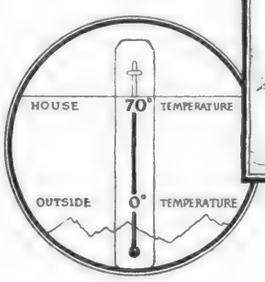
The Sundstrand Franchise

is still open in the following principal and many other smaller cities:

OMAHA, NEB.
DAVENPORT, IA.
LOUISVILLE, KY.
TOLEDO, OHIO
HARRISBURG, PA.
ALBANY, N. Y.
SCHENECTADY, N. Y.
PROVIDENCE, R. I.
DENVER, COLO.

Write or Wire—Your territory may still be open.





Constant electric ignition—which goes on when the machine starts and stays on until the machine stops—full automatic operation and exact control of oil, air and flame assure *complete safety* to homes heated by the Sundstrand.

The Sundstrand Oil Burner was one of the first to carry the Fire Insurance Underwriters' Laboratories Label. You can sell the Sundstrand confident that it will give quiet, economical, dependable warmth with complete Safety.

The exceptional dependability and quality of the Sundstrand and the soundness of the Sundstrand Merchandising Plan are becoming more appreciated every day. The opportunity to build a permanent, profitable business is unlimited. The market is there, the product proven, our merchandising plan is practical and the discount is sufficient to give you a handsome *net* profit.

Sundstrand believes in the Heating and Plumbing Contractor. *Its plans revolve around him.* Write for Details of the Sundstrand Proposition.

SUNDSTRAND ENGINEERING CO.
Dept. H-3, Rockford, Ill., U.S.A.
Manufacturers of precision machinery since 1905

The Burner—
The Building—
The Test—

Rapp and Rapp, Architects, Chicago.
American Plumbing and Heating Co., Heating Contractors, Minneapolis.

The Piccadilly Theatre

It is especially noteworthy that during 1927 both our factory and dealer business showed a marked increase over the preceding year. For full information regarding the Hardinge Franchise, address us.

G. F. GEBHARDT
Mechanical Engineer

Inspection, Tests and Consultation

Office and Laboratories
Armour Institute of Technology

CHICAGO, December 21, 1927.

Hardinge Brothers,
Berteau & Ravenswood Ave., Chicago, Ill.
Att: Mr. A. F. Schmudde.

Gentlemen:

In compliance with your request of the 15th of November the writer examined No. 3 boiler located in the heating plant of the Piccadilly Theater at 1443 Hyde Park Blvd., Chicago, and made a number of observations and tests with a view of ascertaining the combustion conditions in the furnace under various operating conditions. These conditions and the adjustments of the Hardinge burners were controlled by your Mr. Clapham. Tests were conducted on Nov. 17, 1927.

The following observations were made in connection with the inspection.

Burner Set for 40 Gallons.			Air Ring Wide Open.			
1 Draft	Steam Press. Lb. Gage	Stack Temp.	Oil Pressure	CO_2	O_2	CO	Oil Temp.
0.15	1	275	30	15.0	0	0.2	140
II 0.15	1	275	Same as I Oil Supply slightly reduced. 30	15.4	0	0	140
III 0.45	1	325	Same as II only with damper wide open. 30	11.4	6.2	0	140
IV 0.03	1	270	Burner set for 35 gals. Air ring raised 1/16" 30	15.5	0	0.3	Damper partly closed.
0.03	1	270	30	15.6	0	0.3	140

The following additional data was furnished by your Mr. Clapham.
Type of boiler: Oil City Portable Fire-Box Boiler No. 922, 20,000 sq. ft.
Fuel characteristics: 26 deg. Baume; 215 deg. Fahr. flash; 230 deg. Fahr. fire point. Viscosity 103 seconds at 100 deg. Fahr. Saybolt Universal Calorimeter. Carbon Residue 1.4 percent. Sediment 1/20 per cent. No water.

Respectfully submitted,
G. F. GEBHARDT.

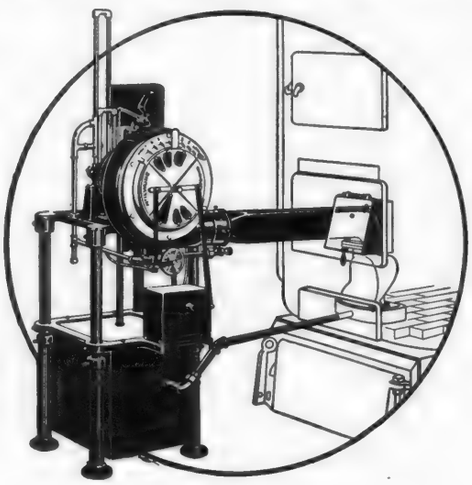
HARDINGE BROTHERS, Inc.
Manufacturers of Precision-Built Machines for 38 Years
Factory and General Offices:
4149 Ravenswood Avenue, Chicago, Ill.
Factory Branches:
CHICAGO Michigan Ave. at Ohio St.
BOSTON 339 Beacon St.

you can safely have confidence in

HARDINGE
FUEL OIL HEAT

See the

McILVAINE OIL BURNER



at the

American Oil Burner Association Convention

Stevens Hotel, Chicago
April 3, 4 and 5
Booth 75

Take advantage of this opportunity to inspect a few of the many McIlvaine installations in the finest homes in Chicago's exclusive North Shore.

Distributors: Here is a distinctively different mechanical draft burner without a gas pilot or electric ignition—with a continuous, graduated flame, automatically adjusted. Our new lower 1928 prices make sales easier.

McILVAINE BURNER CORPORATION
Dept. H
749 Custer Avenue, Evanston, Ill.

MAKING IT EASIER TO SELL

A home should be built around the heating plant. Without good heating, it is but an empty shell during many months of the year. Thrush System always satisfies.

BUILDERS of homes have been educated to buy advertised products. Your sales problems are greatly simplified when the public knows Thrush System by name.

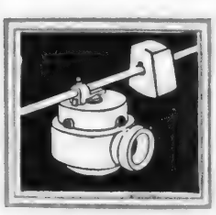
We are telling thousands of builders everywhere that Hot Water Heating is best for their homes and that it is most economically and easily controlled with Thrush System. Cash in on our investment by tying up your business with this big campaign. Push Thrush Equipment for it is the kind of a product you can be proud to sell.

It makes an Automatically Controlled Pressure System from any ordinary gravity hot water job. It will maintain uniform temperatures, reduce fuel consumption, lengthen firing periods and greatly increase the satisfaction which the home owner enjoys. When you install Thrush Equipment, you not only make a nice profit at once, but you make a friend and a booster who will bring you more business.

Nationally Advertised!

In the publications shown above, which are distributed exclusively to individuals planning to build homes and to real estate men and building contractors, Thrush System is being forcefully advertised. A little effort spent on Thrush Equipment in your community will pay big returns Get behind it.

Ask your jobber today



Specify **H. A. THRUSH & COMPANY**
PERU, INDIANA

THRUSH SYSTEM
OF HOT WATER HEATING

H. A. THRUSH & COMPANY. Dept. A. Peru, Indiana
Please send me your catalog and more information about Thrush System. Also send me the booklet which you are distributing to consumers.

Name _____ ***Address*** _____

My Jobber is _____

Oman & Lilienthal, Architects

2130 Lincoln Park West... Chicago

This splendid new apartment hotel overlooking famous Lincoln Park is heated by two No. 4½ Johnson Automatic Rotary Oil Burners installed by the Johnson Oil Burner Company, Chicago.

Oman & Lilienthal, Architects

St. Clair Hotel... Chicago

Two No. 5½ Johnson Rotary Heavy Oil Burners installed by the Johnson Oil Burner Company furnish heat and hot water for this magnificent new Chicago hotel.

THE Johnson Rotary Automatic is approved by Underwriters' Laboratories & New York Board of Standards and Appeals.

928

Johnson Efficiency Means Cold Weather Comfort for *any* Building

TWENTY-THREE YEARS AGO the first S. T. Johnson Oil Burner was built. It was, for the times, unusually efficient.

Today, after twenty-three years of experience, that same high standard is interpreted in terms of advanced design in rotary oil burners for *every type of structure.*

Johnson burners bring positive, continued comfort... plus economy of operation and sturdy strength... natural results of long experience.

See the Johnson Line

AT CHICAGO

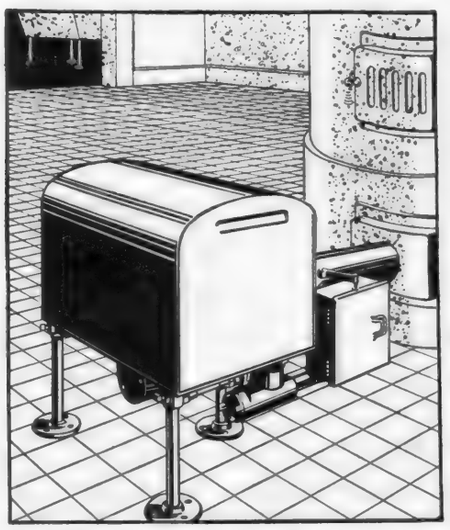
AT the Chicago Convention you will have an opportunity to learn more about Johnson Rotary Oil Burners. Johnson equipment for the smallest home and the biggest building will be on display. And Johnson equipment may be seen in actual operation in many places, two of which are illustrated in this advertisement. Don't fail to familiarize yourself with Johnson efficiency for cold weather comfort.

S. T. JOHNSON CO.
OIL BURNERS
TRADE MARK REGISTERED

Main Office and Factory:
949 Arlington Avenue, Oakland, California
Factory Branch Offices:
San Francisco, Sacramento, Philadelphia
Distributors and Dealers throughout the United States and in Foreign Countries

YOU *will ask*
this QUESTION *when you take on*
an OIL BURNER

"How *much* service does it require?"



Listed as Standard by Underwriters' Laboratories

WE don't know of any burner that requires so little service as the Nu-Way. Here's an example: In one city there were thirteen service calls on 103 Nu-Way burners in six months. All parts of the Nu-Way are readily accessible. It is a marvel of simplicity—as a demonstration will show. There's a Nu-Way for every sized dwelling—and for every purse. Remember, too, it burns the cheapest grades of oil.

MEMBER OIL HEATING INSTITUTE

NU-WAY

An Automatic
OIL BURNER

Write for Catalog, Prices and Terms

Manufactured by

THE NU-WAY CORPORATION

Rock Island, Ill.

Dependable Webster Ignition *Helps you Sell!*

The Webster Ignition Transformer can be furnished with either single or double high tension terminals, 110 or 220 volts, 60 cycle, 110 or 220 volts, 25 cycle.

THE Webster Ignition Transformer should be on the oil burner you sell...The reasons are obvious... Webster adaptability meets the requirements of many-frequencied communities... It produces an unusually intense spark at normal voltage with a very low power input... It operates efficiently over an extremely wide voltage range ...Operating heat of transformer is well within standard limits...It is efficient, economical and reliable...It requires practically no servicing...Secure this selling asset by insisting that theWebster Ignition Transformer be standard equipment on the oil burner you handle.

Webster Ignition Transformer

WEBSTER ELECTRIC COMPANY
RACINE, WISCONSIN, U. S. A.
Specialists in Oil Burner Ignition

HART OIL HEAT

UNMATCHED PROGRESS IN SIX SHORT MONTHS

Last October, A. E. MacInnis, R. S. Bohn and Spencer A. Merrell, representing their distributor organizations, The Power Plant Engineering Co., Seattle, Preferred Utilities Co., New York, and Merrell & Co., St. Louis, joined hands with a few associates and took over the Hart Oil Burner factory, at Peoria, Illinois.

Achievements for the first half of the year include: Reorganization—building up a sales force of foremost oil burner men to intelligently serve our dealers—changing slightly the design of Hart Burners to increase salability—improving every detail of manufacture to reduce dealer service and installation costs—designing, building and field-testing a new, small burner to thoroughly round out the Preferred-Hart line.

But this is not all—in the same six months there has come to us, unsolicited, some foremost distributors and many well-known dealers—men realizing that in the Preferred-Hart, in our franchise and in our organization they could get their ideal of a burner, a contract and business associates.

We offered, and are delivering these newcomers, an efficient automatic oil burner on a small factory profit basis—discounts that eliminate overbuying in order to get favorable prices—exclusive territory—ideal plans and methods that have won national prominence—special sales helps based on the successful retail experiences of the officials of this company—and, judging from dealers' comments, the fairest selling agreement ever written for the retail burner business.

The news of what we were offering spread like wildfire. Dealers came, wired and wrote. All were enthusiastic. Almost, to a man, they wanted our franchise.

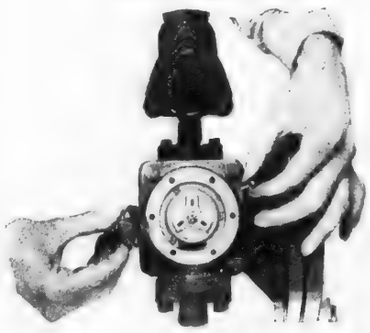
We honestly believe no other oil burner concern ever built up, in six short months, a dealer organization the rival of this in quality. Quality is what we want.

We still have a few desirable dealerships available. But we want dealers with oil burner experience. We know we can help these men make some real money. If you are interested, we will be glad to hear from you.

Just off the press—a description of the Preferred-Hart Oil Burner written in a new and novel way. Let us give you the interesting facts about the success of this better burner.

Preferred Oil Burners, Inc.
PEORIA ILLINOIS

It has set its own standards—

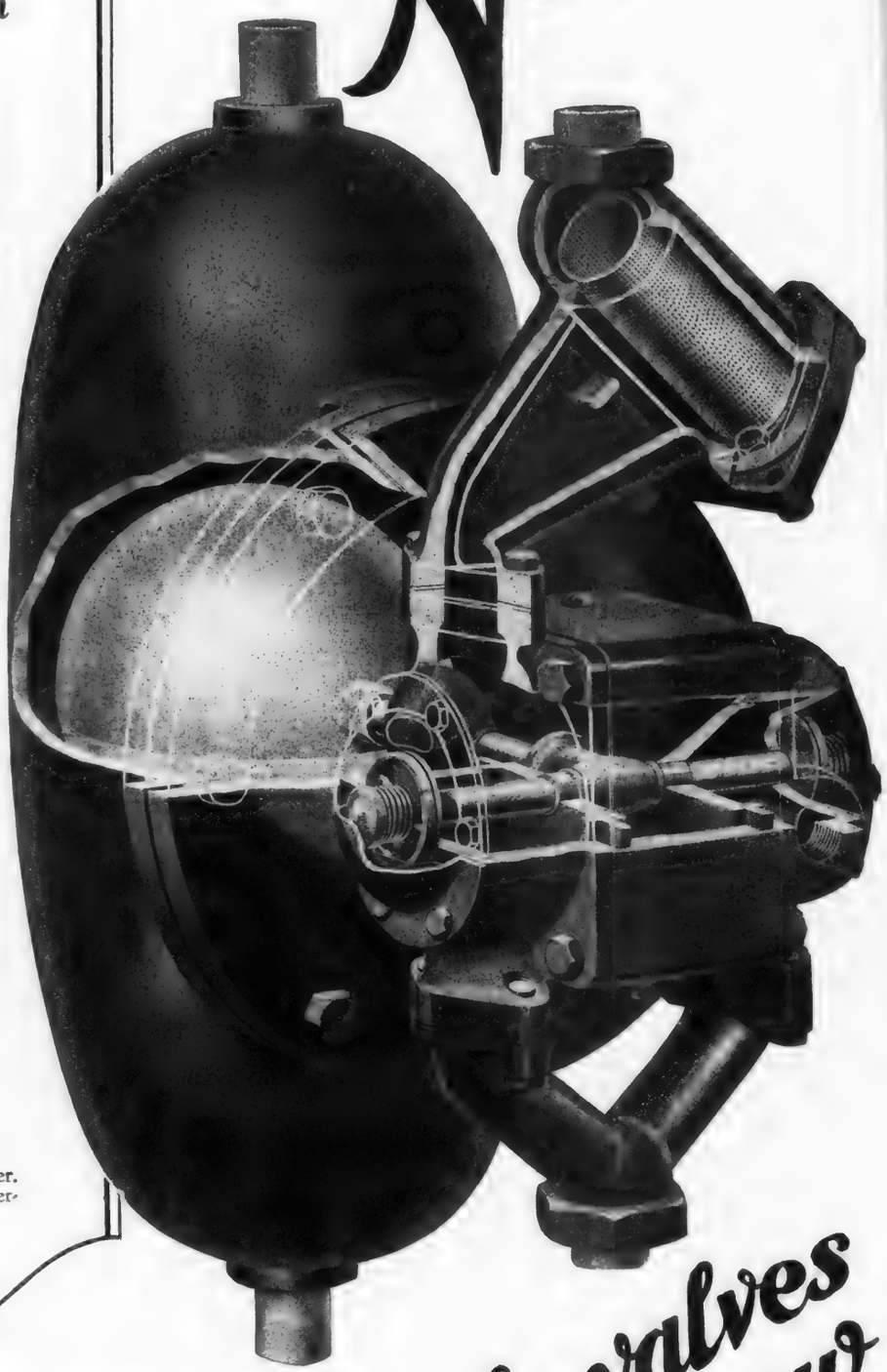


Water line or differential easily adjusted

Note the rotary valves of cast phosphor bronze working against monel seat. The rectangular orifices are ideal for water passage and are quick acting. The cracked valve condition—the cause of wire drawing—is eliminated. Valves of this type are self-grinding—improve with service, instead of pitting, corroding and sticking. Valves are removed from float chamber and this keeps feed water below point at which it forms scale. Note that the timing of the valves may be changed by moving them to the positions indicated by the numerals. As a result, the water line may be changed to one inch higher or lower *after* the feeder is installed and the differential may be set at 1, 2, 3, 4 or 5 inches.

The large conveniently removed strainer. This makes cleanliness and positive operation doubly certain.

Now—



With the valves that Stay New

Coupon brings facts

McDONNELL & MILLER
710 WRIGLEY BUILDING, CHICAGO

Please send complete description and new engineering data covering your new self-cleaning Duplex Feeder.

*Name*_____

*Address*_____

*Business name*_____

H3

the duplex-feeder is REVOLUTIONIZED!

The weak points of former feeder construction have been turned into points of strength in this new McDonnell & Miller Self-Cleaning Duplex Boiler Feeder

NOT satisfied with merely creating new standards for duplex boiler feeder construction, McDonnell & Miller have now totally re-created the duplex-feeder—have literally stepped it years ahead of all former conceptions of a good duplex feeder. New certainty of operation, new ease of adjustment, greater capacity, and valves that "stay new," are among the features that have been made possible by the new and totally different design that is clearly brought out in the illustrations opposite.

Rotary Valves That Always Work

The sticking and wire drawing that went with the sliding valves of former feeders, especially where the feed water was exceptionally hard, have been entirely eliminated by the rotary valves of this advanced feeder. In this way, the heart of the feeder has been made equal to any conceivable conditions of water supply. Moreover, a large accessible strainer has been added to provide still greater certainty of operation.

Greater Capacity

Note that the full city pressure is utilized to force the water into the boiler. As a result of highly refined valve construction there is practically no loss in pressure and this means greater capacity —a feature that is of vital importance where water feeders are used as a safety device in connection with electrically driven condensate or vacuum pumps.

All Parts Rotate

Here is a duplex-feeder in which there is not a single sliding part, and therefore not a sticking part. It is a feeder which contains almost countless refinements such as quickly adjustable self-grinding valves, single float, stream line water passages, and many other evidences of perfected design, uncompromised materials, and finest workmanship.

Thoroughly Proved in Service

The statements made here are based on actual service tests that have been conducted during the past year. In these tests the feeder has been subjected to conditions far more trying than any which can arise in ordinary service. One feeder has been working perfectly 24 hours a day in a city where the water is 38 grains hardness and where the sliding valve feeder which it replaced required weekly cleaning.

Try One on Your Toughest Job

To fully realize the perfection of this feeder, simply try it where other feeders have failed! The coupon opposite brings complete description. Do it now.

McDONNELL & MILLER, *710 Wrigley Building, Chicago*

The new

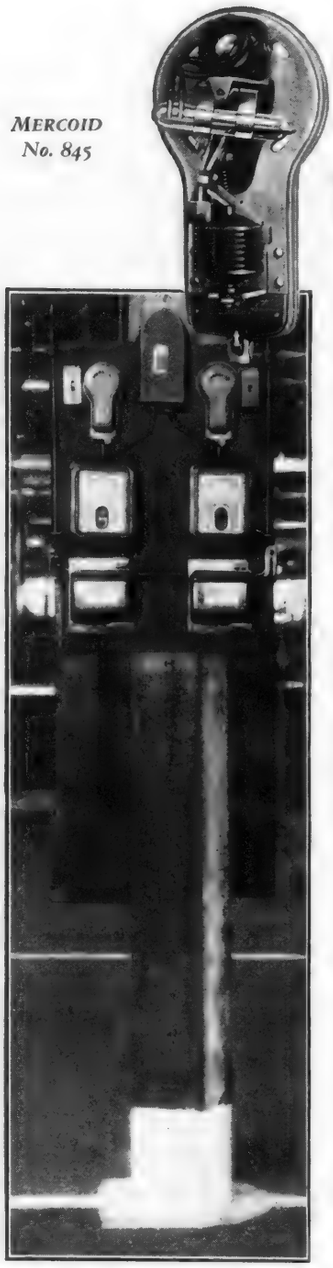
McDONNELL & MILLER

SELF-CLEANING

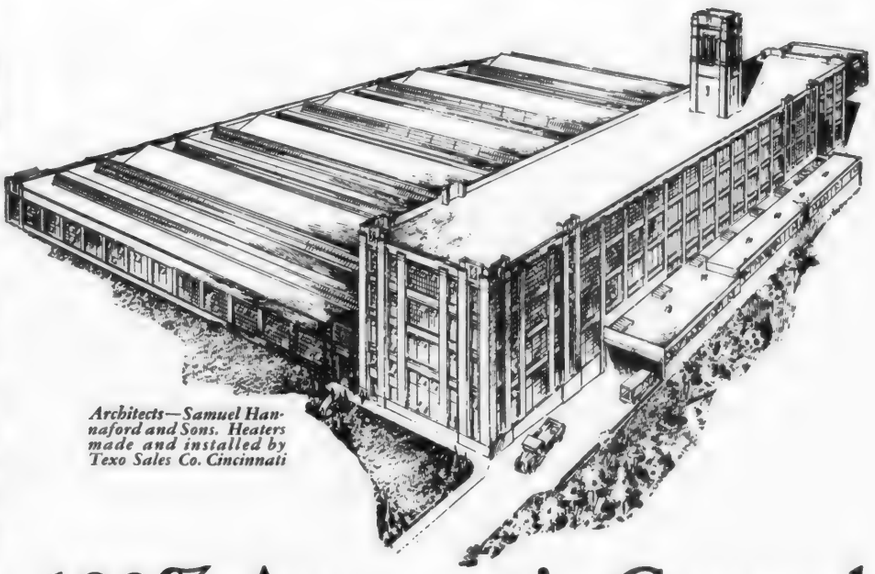
Duplex Feeder

"Doing one thing well"

MERCOID
No. 845



MERCOID thermostats for all types of unit heaters are furnished with two standard ranges—56° to 80° and 38° to 60°. Higher and lower temperatures can be supplied. MERCOIDS carry the full line current, 110 or 220 volts. There is no corrosion of contacts, no exposed arc. On unit heaters using steam MERCOIDS start and stop the fan or, if desired, can control the steam supply, or accomplish both.



Architects—Samuel Hannaford and Sons. Heaters made and installed by Texo Sales Co. Cincinnati

100% Automatic Control of 50 Gas Unit Heaters *with* MERCOID

THERE could be no more convincing evidence of the economy and dependability of MERCOID controls for unit heater work than the installation at the John Van Range Company of Cincinnati, Ohio.

This factory—440 feet long by 410 feet wide—is heated by fifty Sterling Gas Unit Heaters, suspended from the roof structure.

These heaters are 100% automatically controlled by No. 845 MERCOID thermostats. During the day the MERCOIDS start and stop the fan motors—also open and close electric gas valves in the gas supply according to the temperature requirements at the degree for which the MERCOID is set. There is no overheating—no waste of gas or current—no loss.

The illustration at the left shows one of the control panels. The clock switch cuts out the MERCOIDS during the night and puts them back in control early enough in the morning so that the plant is warm when the employees arrive.

A broad line of MERCOID instruments are available for control of temperature, pressure or vacuum. For oil burners, unit heaters, blowers, refrigeration and a host of other industrial applications.

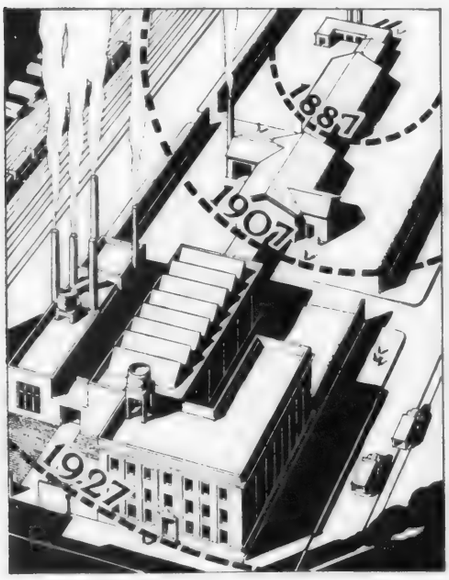
Write today for detailed data and special booklet showing the various MERCOID uses.

AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION DEPT. H.

816-820 South Michigan Avenue Chicago, Illinois

Makers of IDEAL Boilers, AMERICAN Radiators, ARCO Tank Heaters, VENTO Ventilating Heaters, AIRID Air Valves, MERCOID Controls and devices for drying, humidifying, cooling and refrigeration.



—extended . . . again . . . and again!

The construction of extensions provides occasion for owners to check up on the materials and equipment used in existing plants. Investigation reveals the fact that the selection of Webster Systems of Steam Heating as initial equipment is followed almost without exception by the selection of Webster Systems for extensions.

- since 1888

Webster Systems of Steam Heating

Warren Webster & Company, Camden, New Jersey
Pioneers of the Vacuum System of Steam Heating
52 U. S. Branch Offices—*In Canada, Darling Bros., Ltd., Montreal*

More than 46,000 installations in America's finer buildings

SOME Webster Systems of Steam Heating that have been extended in recent years—many of them *again and again*.

Federal Reserve Bank, Atlanta, Ga.; Republic Cotton Mills, Great Falls, S. C.; State Office Building, Columbia, S. C.

Harvard University, Cambridge, Mass.; Massachusetts Institute of Technology, Cambridge, Mass.

Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.; University of Pittsburgh, Pittsburgh, Pa.

Champion Spark Plug Co., Toledo, Ohio.

University of Missouri, Columbia, Mo.; Washington University, St. Louis, Mo.

R. H. Macy & Co., New York, N. Y.; Utica Knitting Co., Utica, N. Y.; Metropolitan Life Insurance Co., New York, N. Y.

Catholic University, Washington, D. C.; Mt. Alto Hospital, Washington, D. C.; National Park Seminary, Forest Glen, Md.

Providence Hospital, Seattle, Wash.; Orthopedic Hospital, Seattle, Wash.

Bullock's (Dept. Store), Los Angeles, Calif.; Huntington Hotel, Pasadena, Calif.; San Diego County Hospital, San Diego, Calif

Dow Chemical Co., Midland, Mich.; Buick Motor Co., Flint, Mich.

Berkey & Gay Furniture Co., Grand Rapids, Mich.; American Seating Co., Grand Rapids, Mich.; Reo Motor Co., Lansing, Mich.

Inland Steel Co., Indiana Harbor, Ind.; University of Notre Dame, Notre Dame, Ind.; University of Illinois, Urbana, Ill.; International Harvester Co., Deering Works, Chicago, Ill.

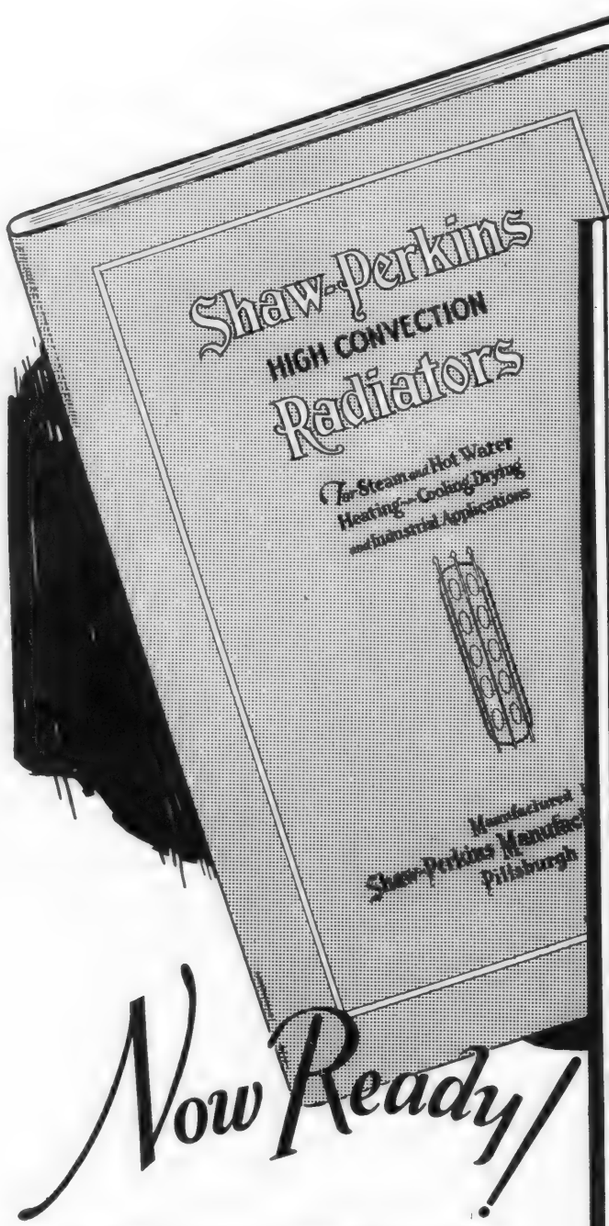
Textile Machine Works, Reading, Pa.; Germantown Hospital, Philadelphia, Pa.; Merion Worsted Mills, West Conshohocken, Pa.

Nash Motor Co., Kenosha, Wisc.; Gisholt Machine Co., Madison, Wisc.; Wisconsin State Capitol, Madison, Wisc.; Bucyrus Co., South Milwaukee, Wisc.; Horlick's Malted Milk Corp., Racine, Wisc.; C. B. & Q. R. R. Shops, Havelock, Neb.

Endicott Johnson Corporation, Endicott, N. Y.

National Cash Register Co., Dayton, Ohio.

Todd Protectograph Co., Rochester, N. Y.; Stromberg-Carlson Telephone Co., Rochester, N. Y.



Now Ready!

A NEW CATALOG upon Shaw-Perkins High Convection Radiators is just off the press. Read other interesting facts about the radiators. See the many distinctive features. Learn the scientific basis upon which the radiators are rated. Get the full story of this modern radiator. Send for catalog "H".

Shaw-Perkins
HIGH CONVECTION
Radiators

REPRESENTING an advanced design in Shaw-Perkins standard oval tube radiation, which contains original and valuable features found only in this distinctive type of heating surface.

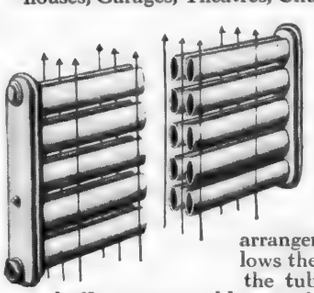
Light in Weight: The radiators are built in low, narrow one piece, jointless units, as long as 14 feet and weigh about one-third as much as other forms of direct radiation.

Heat and Cool Quickly: The light uniform walls cause them to respond promptly to the turn of the valve, giving quick and positive control over room temperatures.

Save Space: The radiators occupy about one-third less space than other forms of direct radiation. Brackets or legs can be supplied for either wall or floor installation.

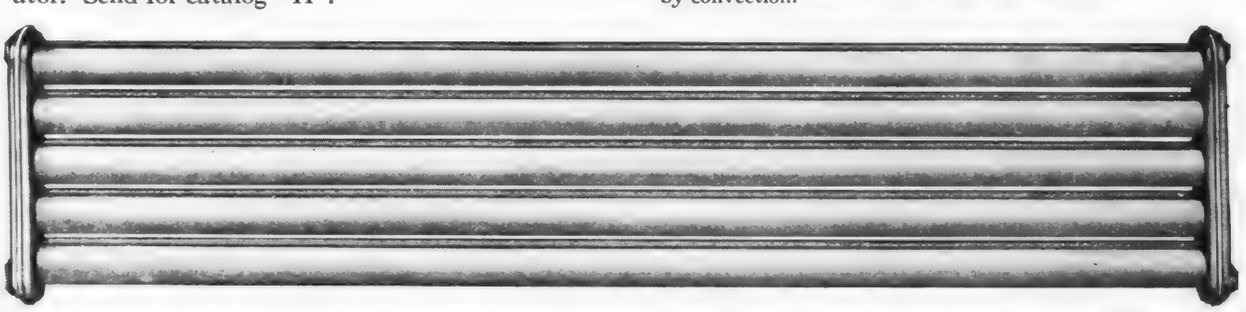
Absolutely Sanitary: The radiators have no rough surfaces or fins to act as dust entanglements. All surfaces are smooth and easily accessible for hand wiping.

Unusually Adaptable: The light weight, the distinctive design and the unique dimensions of the radiators, make them suitable for installation upon walls, under windows, in recesses, upon columns, pilasters, etc. They are most desirable for heating Factories, Warehouses, Greenhouses, Garages, Theatres, Churches, Stores, Dwellings, etc. The radiators are also particularly adapted to various drying and cooling purposes and industrial uses.



"High Convection"

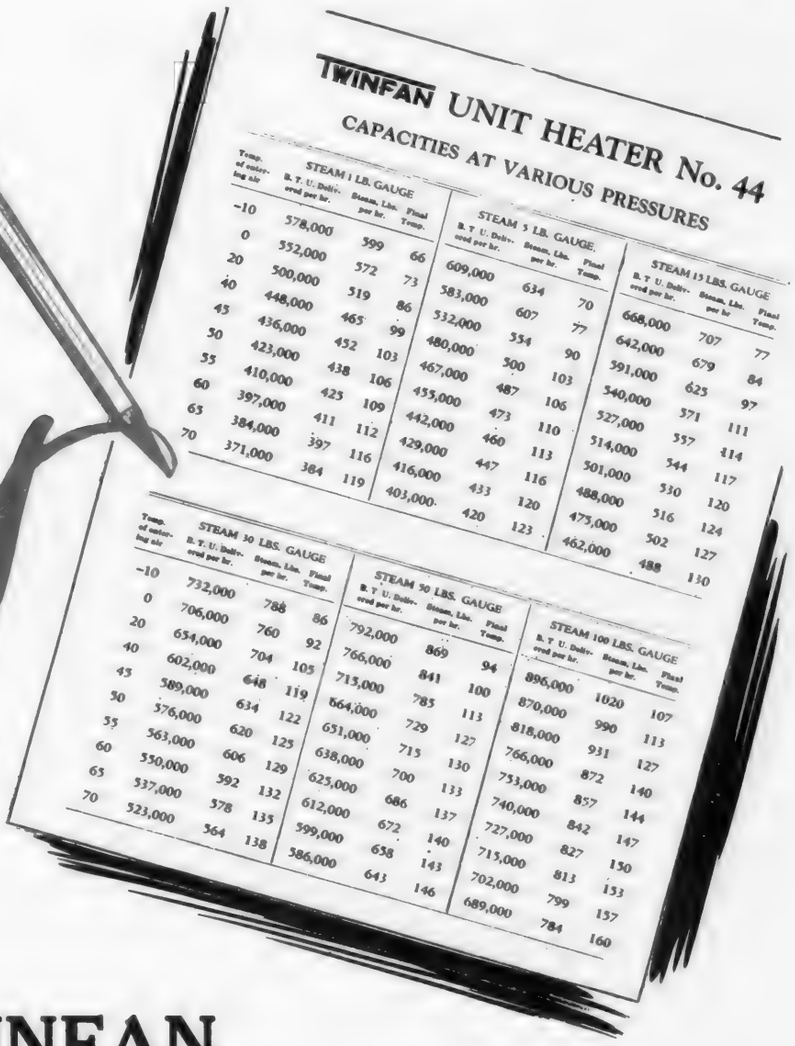
The Shaw-Perkins High Convection Radiator is all prime heating surface. The ingenious arrangement of the oval tubes allows the air to pass freely over the tubes, unimpeded by fins, baffles, or top and bottom hub connections, consequently the radiator has a high heat emission by convection.



Shaw-Perkins Manufacturing Company, Pittsburgh, Pa.

Above is shown a Twinfan Unit Heater suspended from a brick wall. It rests on an angle and the top corners are supported by strap hangers.

Easy to Figure



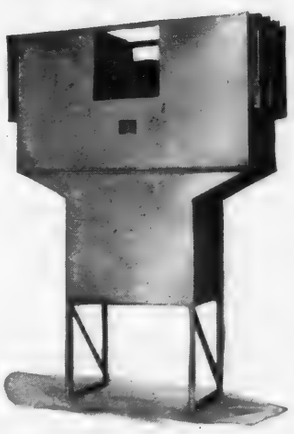
TWINFAN UNIT HEATER No. 44

CAPACITIES AT VARIOUS PRESSURES

Temp. of entering air	STEAM 1 LB. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.	STEAM 5 LB. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.	STEAM 15 LBS. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.
−10	578,000	599	66	609,000	634	70	668,000	707	77
0	552,000	572	73	583,000	607	77	642,000	679	84
20	500,000	519	86	532,000	554	90	591,000	625	97
40	448,000	465	99	480,000	500	103	540,000	571	111
45	436,000	452	103	467,000	487	106	527,000	557	114
50	423,000	438	106	455,000	473	110	514,000	544	117
55	410,000	425	109	442,000	460	113	501,000	530	120
60	397,000	411	112	429,000	447	116	488,000	516	124
65	384,000	397	116	416,000	433	120	475,000	502	127
70	371,000	384	119	403,000	420	123	462,000	488	130

Temp. of entering air	STEAM 30 LBS. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.	STEAM 50 LBS. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.	STEAM 100 LBS. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.
−10	732,000	788	86	792,000	869	94	896,000	1020	107
0	706,000	760	92	766,000	841	100	870,000	990	113
20	654,000	704	105	715,000	785	113	818,000	931	127
40	602,000	648	119	664,000	729	127	766,000	872	140
45	589,000	634	122	651,000	715	130	753,000	857	144
50	576,000	620	125	638,000	700	133	740,000	842	147
55	563,000	606	129	625,000	686	137	727,000	827	150
60	550,000	592	132	612,000	672	140	715,000	813	153
65	537,000	578	135	599,000	658	143	702,000	799	157
70	523,000	564	138	586,000	643	146	689,000	784	160

A Heating Installation with the NEW TWINFAN CAPACITY TABLES



The heat unit output of the improved TWINFAN Unit Heater is a fixed and definite quantity; and we have made up capacity tables complete for steam from one to 100 lb. gauge, and for temperature of entering air from—10 deg. to 70 deg.

The capacities used on these Twinfan Unit Heater tables were determined by elaborate tests conducted in accordance with standards adopted by the Industrial Unit Heater Assns. and are fully guaranteed.

With these tables you can confidently lay out a heating installation, and install the necessary TWINFAN Unit Heaters, with the assurance that the building will be correctly and economically heated throughout.

These TWINFAN Heating Capacity Tables will be sent on request.

DWYER EQUIPMENT CO.

4534 W. NORTH AVE. CHICAGO, ILL.

HEAT WITH TWINFAN UNIT HEATERS

New

The Thermodine Smoke Bomb Test

THE photograph above shows how the motor driven fan of the Thermodine Unit Heater drives heated air down to the occupied zone.

The heated air naturally rises after warming the lower strata. As it reaches the plane of the Heaters, it is drawn in, reheated and again circulated downward. This method of heating eliminates undue accumulation of warm air at the roof. Saves fuel through concentration ot heat where needed! Insures greater comfort.

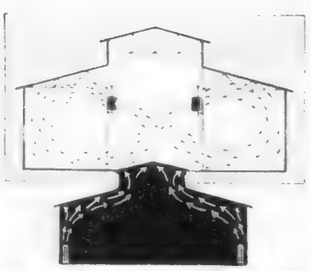


Diagram showing the difference in course of heat circulation with Thermodine Unit Heaters (*drawing above*) and with cast iron radiation (*drawing below*).

ThermoDine

Unit HEATER

A MODINE Product

FOR STEAM OR HOT WATER HEATING SYSTEMS

Flexibility
in Industrial Heating

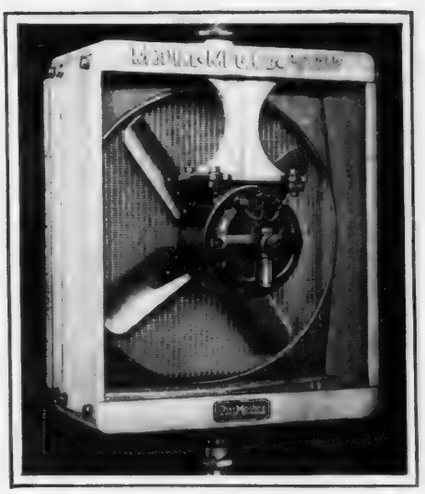
THERMODINE Unit Heaters give *flexibility* to a heating system, impossible with old fashioned heating methods.

In buildings requiring a large amount of radiation, Thermodine Unit Heaters can be strategically located to deliver the heat *down* wherever it is needed. They suspend from the steam main out of the way, focusing heat wherever it is desired. They can be easily located to accommodate any heating conditions that may arise after their installation. Where a large number of Thermodine Unit Heaters are installed, part of them may be turned off as occasion demands. In mild weather, or in parts of a building where heat is required intermittently, some of the heaters may be shut off and only those permitted to run that are necessary. A remarkable saving of fuel and power is thus accomplished. Real *flexibility* in heating — in every sense.

Furthermore, *portability* of Thermodine Unit Heaters makes their installation a sound investment. In case it is desired to move some of the heaters to another building, or another portion of the same building, a Thermodine Unit Heater can be quickly taken down, moved and connected in a new location at slight expense. This portability is made possible by their light weight and method of suspension—outstanding Thermodine features.

Let us send you complete information and the name of our nearest representative. He will give further details and tell you of some of the installations we have in your vicinity.

MODINE MANUFACTURING CO. *(Heating Division)*
1707 RACINE STREET RACINE, WISCONSIN
Branch offices in all large cities



Thermodine Unit Heater No. 701
Is the equivalent of two tons of direct radiation—between 600 and 700 sq. ft.

Thermodine Utility Heater — No. 101
The smallest Thermodine — 12″ wide, 12″ high, 9½″ deep. Equivalent of 90 to 100 sq. ft. of direct radiation. There's a Thermodine adaptable to every size space.

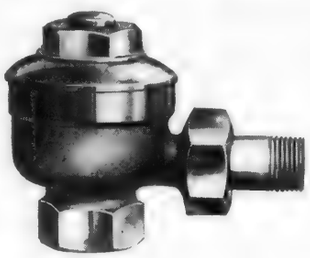
ThermoDine
Unit HEATER
of MODINE Product

FOR STEAM OR HOT WATER HEATING SYSTEMS

Speaking of "Margin of Safety"

Every part entering into every B. & J. Valve is individually inspected and tested before assembling, and then—

Heart of Vapor System



To insure satisfying installations, Barnes & Jones submit every assembled valve they make to a water and steam pressure test of extreme severity. Only supervalves, which are sure to go through years of service without break or leak, come through the test and leave the factory.

Made Like an Instrument

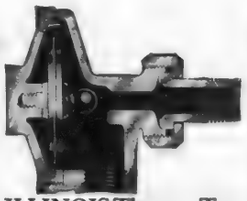
Instruments are tools that are finely made for fine work—made to work as precisely the fifth year as the first. B. & J. Valves are made like an instrument because the vapor system is only as efficient as its return valves. For example, all B. & J. Valves are made not of the commonly-used red brass or cast-iron, but of bronze. Before specifying, compare B. & J. valves, point by point, with any on the market.

Barnes & Jones

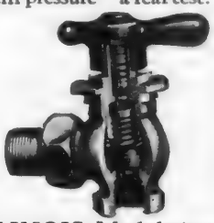
QUALITY HEATING SYSTEMS

128 Brookside Ave., Jamaica Plain, Boston

126 East 44th St. New York City

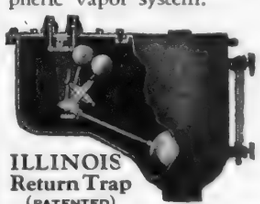


ILLINOIS Thermo Trap
The Original Vertical Seat Trap. Permanently adjusted—self cleaning. Vertical seat avoids trouble by stoppage from dirt. Sensitive and accurate in operation because the diaphragm closes AGAINST the steam—not IN it. Will withstand 100 pounds steam pressure—a real test.



ILLINOIS Modulating Valve—Graduated, Quick-Opening, Packless.

ILLINOIS Heat Retainor
(BROWNE PATENT)
The only device of any description which permanently combines successfully, vacuum circulation, or steam circulation below atmospheric pressure, together with all the advantages of an open atmospheric vapor system.

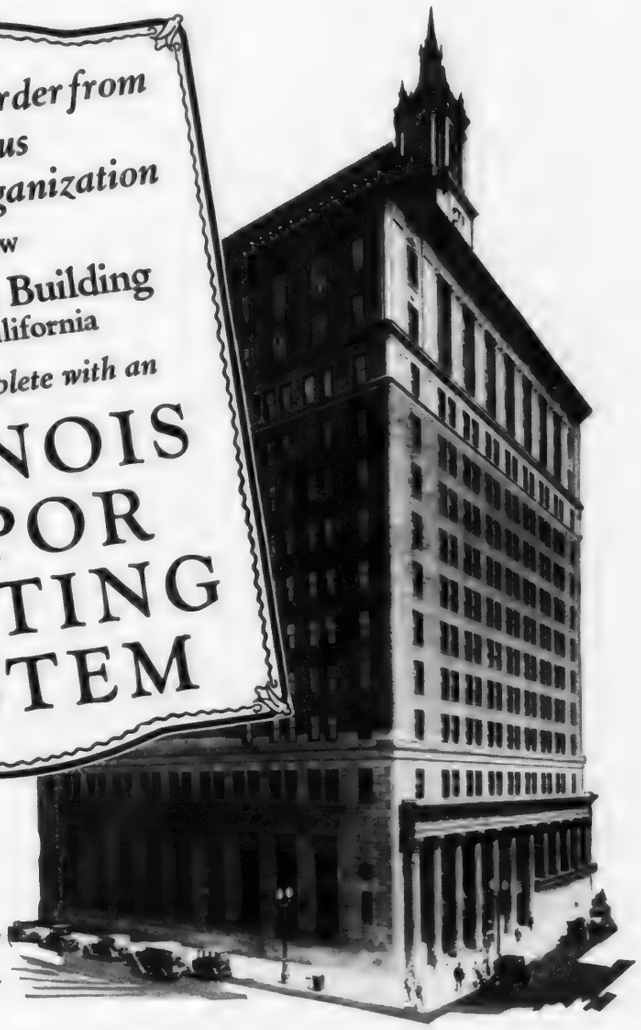


ILLINOIS Return Trap
(PATENTED)
The Original Return Trap embodying the features of self-contained mechanism—no external working parts to be tampered with or injured—no stuffing boxes or packed joints—insuring continuous satisfactory operation.

Another repeat order from the famous Bank of Italy organization

The New
Bank of Italy Building
San Jose, California
is equipped complete with an

ILLINOIS VAPOR HEATING SYSTEM



H. A. Minton,
Architect
Chas. T. Phillips,
Consulting Engineer
Jas. H. Pinkerton Co.
Heating Contractor

ILLINOIS VAPOR SYSTEMS give rapid and positive circulation of steam throughout the largest buildings without pumps and insure flexible and noiseless operation, durability of apparatus and a remarkable fuel economy.

The superior Vapor devices shown here are developments exclusively our own. Their use in every type of building for many years has amply proved their dependability and accounts, in a large measure, for the nation-wide success of ILLINOIS SYSTEMS.

***Write for* "VAPOR DETAILS" *Bulletin* 22**

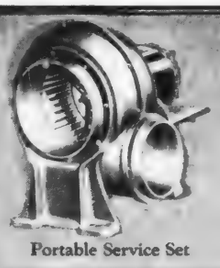
REPRESENTATIVES IN 40 CITIES OF U.S.A.

ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD President INCORPORATED 1900

CHICAGO

Massachusetts Type V
Unit Heater
Side Panel Removed to Show Interior


Portable Service Set

Massachusetts Modified Squirrel Cage Fan

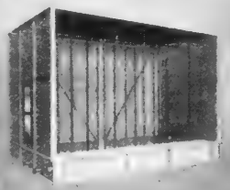
Universal Type Fan

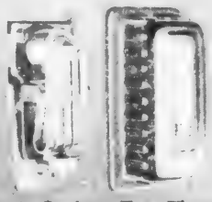
The World's Most Complete Line

The Bishop & Babcock Line comprises Vacuum and Vapor low pressure Heating Specialties; a complete system of Automatic Temperature and Humidity Control; Massachusetts Squirrel Cage Fans Air Washers and Unit Heaters.

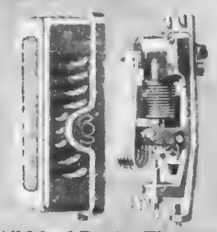
Architects and Engineers who standardize on Bishop & Babcock apparatus insure uniformity in design and operation not to be found in equipment of varied manufacture.

THE BISHOP & BABCOCK SALES CO.
General Offices CLEVELAND, OHIO


Type B Massachusetts Air Washer

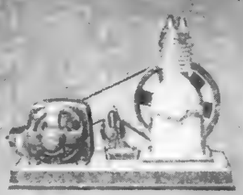

Positive or Graduate Type Thermostat

B & B
Compound Utilostat


All-Metal Duplex Thermostat

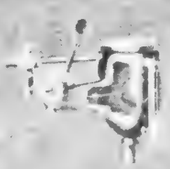
B & B Multiflex
Damper Motors

B & B Mixing Damper

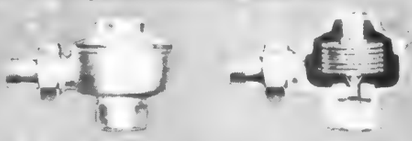

Air Compressor

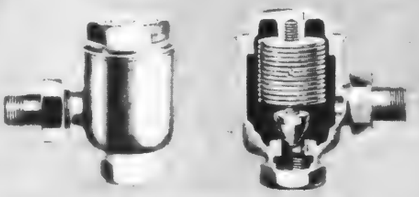
B & B All-Metal Pneumatic Valves

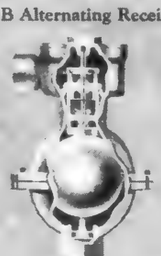
B & B Multiflex Radiator Valves


B & B Alternating Receiver

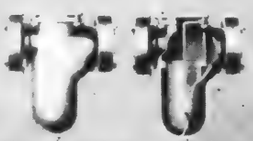
B & B Special Multiflex Radiator Valves


B & B No. 6 Multiflex Trap


B & B No. 3 Multiflex Trap


B & B 4V Vent Valve

B & B Blast Trap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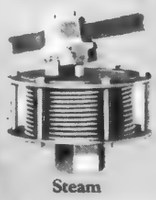
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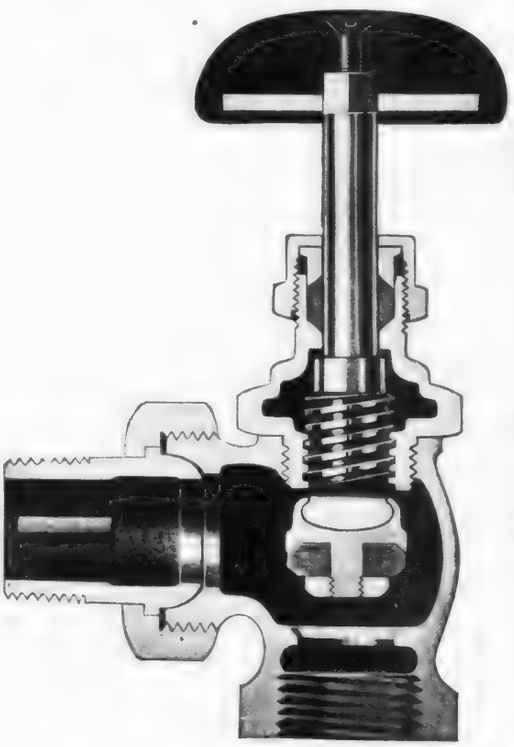

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Fig. 250—Globe
Fig. 350—R. H. Offset
Fig. 450—L. H. Offset
Fig. 550—Back Offset

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Fig No. 209
PACKLESS VALVE

Fig. No. 12
AIR ELIMINATOR

Fig. No. 1
THERMOSTATIC TRAP

Fig. No. 85
DUPLEX BOILER
FEEDER

Fig. No. 80
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A Message
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The alert journeyman, who is an efficient workman with ambition to become a salesman, has a wonderful opportunity of building a greater business for his employer* and making a name for himself. It is on his hundreds of service calls during the year that this opportunity presents itself. Because of his close contact with the householder he will find numerous chances to recommend and sell improved accessories which will provide greater heating comfort. It is the journeyman who can see what is needed and nine times out of ten the householder will take his advice.

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AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION

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The Pioneer!!

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And the Pioneer still leads

Because Aerofin's helical-fin extended surface is *metallicly* integral with the tubes. Heat is conducted thru metal as is electricity. Only an actual metallic *union* affords the unresisted heat flow that makes *all* of the extended surface fully effective. Only an actual metallic *union* renders the construction *permanently* effective,—safe from decreasing efficiency due to accumulation of insulating dust or dirt between prime and extended surface, or to loss of contact by physical separation.

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And the Aerofin Corporation, not content with supremacy of products, has again pioneered as the first manufacturer of Heating Surface to provide complete proved Engineering and Installation Data, insuring the most effective *application* of its products. Low Pressure Aerofin Bulletin No. 7 contains 18 Piping Diagrams in four colors, representing the actual experience of the foremost Engineers in the United States. A copy will be sent, gratis, upon request.

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For pressures from 25 to 350 lbs.
Continuous Seamless Tubes

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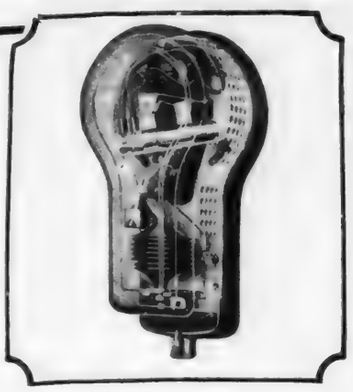
Unit Heaters are flexible, efficient, economical in operation and have an unusually low first cost for heating systems.

When controlled by the Mercoid System of Direct Control, perfect regulation of temperature is definitely assured. Steam and power are conserved.

Mercoid Thermostats permit the highest possible efficiency of automatic control. For Unit Heater use, they are furnished with a standard range of 56° to 80° and, for lower temperatures, a range of 38° to 60° is available. Higher or lower temperature ranges can be supplied.

These instruments operate on regular line currents for normal working loads of 10 amperes at 110 volts or 5 amperes at 220 volts, either A.C. or D.C. As a pilot switch, where used in series with the proper starting switch, the Mercoid will automatically control motors of the largest size. No transformers are required for voltages up to 220.

Mercoids are available for practically every operating condition.



Mercoid Thermostat—Figure 21. Standard range 56° to 80° F. Operating Differential of 2°.

Mercoid Boiler Control—Figure 31. Pressure Type for Steam and Vapor Boilers.

Write for complete information on Mercoid Controls for Unit Heaters

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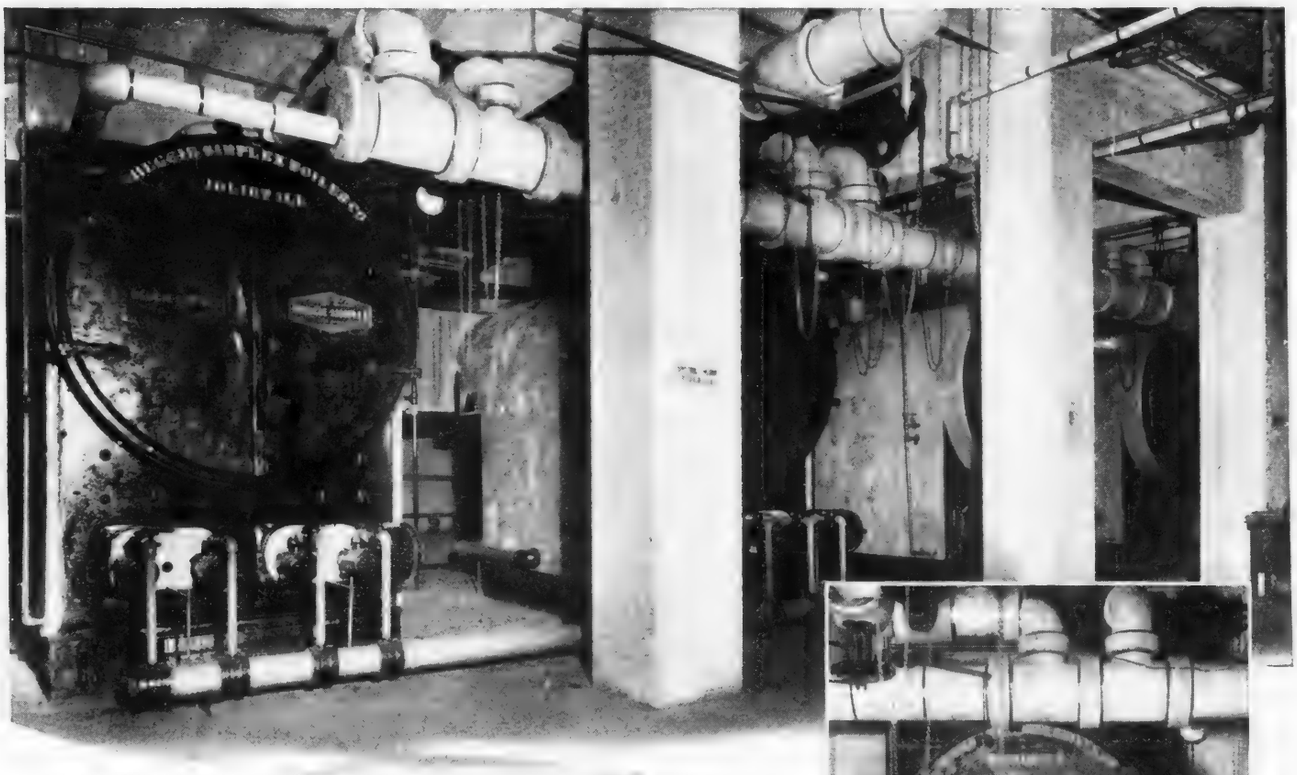
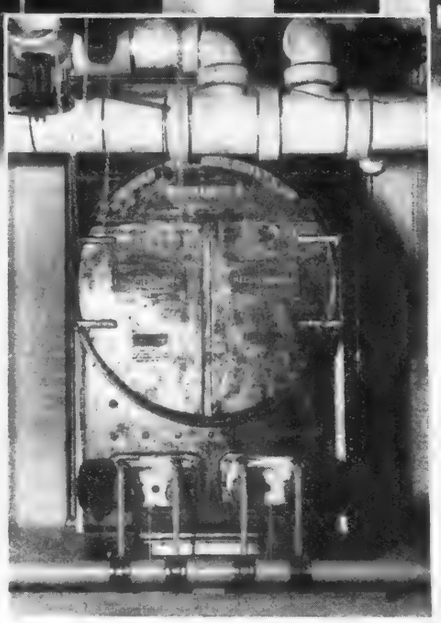


Battery of four gas fired Heggie-Simplex Steel Boilers installed in the Charleston, West Virginia, Senior High School.



Boiler number two of battery.

The Foundation for Scientific Teaching.

WHERE the health and comfort of school children depend upon sure and even heat—in the most modern of America's school buildings—you find Heggie-Simplex Steel Boilers steadily growing in popularity. Their design, their dependability, their economy—appeal to architects and engineers because arrived at scientifically.

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ELECTRIC-WELDED STEEL HEATING BOILERS

The Heating and Ventilating Magazine

VOL. XXV — Reg. U. S. Pat. Off. Reg. Canadian Pat. and Copr't Off. — No. 3

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Helpfulness

"HIS courtesy and consideration for others were not garments hiding deficiencies of disposition; they were logical expressions of the instinct for helpfulness which marks the unpremeditated gracious acts of a gentleman."—*From the New York Sun's appreciation of Lawrence Reamer, one of its editorial writers.*

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G. V. Almquist

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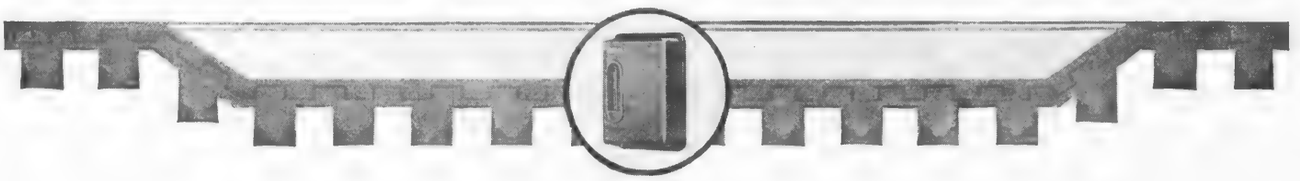


The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

MARCH, 1928

12,000,000 Railroad Passengers Served by Oil Heat

By J. L. Bracken

Assistant to Mechanical Superintendent, New York, New Haven and Hartford Railroad

TWELVE million people ride into and out of Grand Central Station, New York, during the heating season in cars heated by oil fuel. The probabilities are that not more than the proverbial "baker's dozen" know that liquid fuel is the source of their comfort.

The New York, New Haven and Hartford Railroad daily handles about 25,000 passengers in and out of Grand Central Terminal. Cars drawn by electric locomotives are heated by steam generated in oil-burning boilers installed in the locomotives; the self-propelled multiple-unit cars are heated by electricity.

The problems confronting the mechanical department of the New York, New Haven & Hartford Railroad in providing heat for cars drawn by electric locomotives were considerably different from those of office, shop or home heating, so specialized apparatus was required best to perform the service. For railroad use the equipment must be as light, simple and compact as possible, yet the capacity must be large and the devices reliable.

In heating systems for buildings the condensate is returned to the boiler. In train heating this has not been found practicable, so sufficient water must be carried for a trip with a margin allowed for safety in case the train is delayed. In building systems all parts are within the heated space, while, in train heating, parts of the system are unavoidably exposed.

In making up trains, or in changing locomotives, the cars are cut off for a time from the source of heat. These conditions mean a frozen line if proper precautions are not taken in handling the locomotives and cars en route, and while in the car yard. In building systems a pipe size can be used throughout that is consistent with the pressure, volume and distance steam is to be transmitted.

In train heating the connections between cars must be of such size that they are flexible and easily handled. Rubber hose has been the general standard, but flexible metallic connections which permit higher pressures and larger diameters are now being tried. A hose of fabric and rubber also is being developed, which can be used to meet the same requirements.

Since cars are constructed with bodies of steel and glass, although insulated, heat losses are much greater than in buildings with thick walls of insulating materials. Further, all sides of the cars are exposed. Cars running in cold climates are equipped with double or even triple windows. The frequent opening of doors and the action of the ventilators increase the duty on the heating system over that encountered in building practice. Wind and high speed, as well as low temperature, increase the quantity of steam required per car per hour.

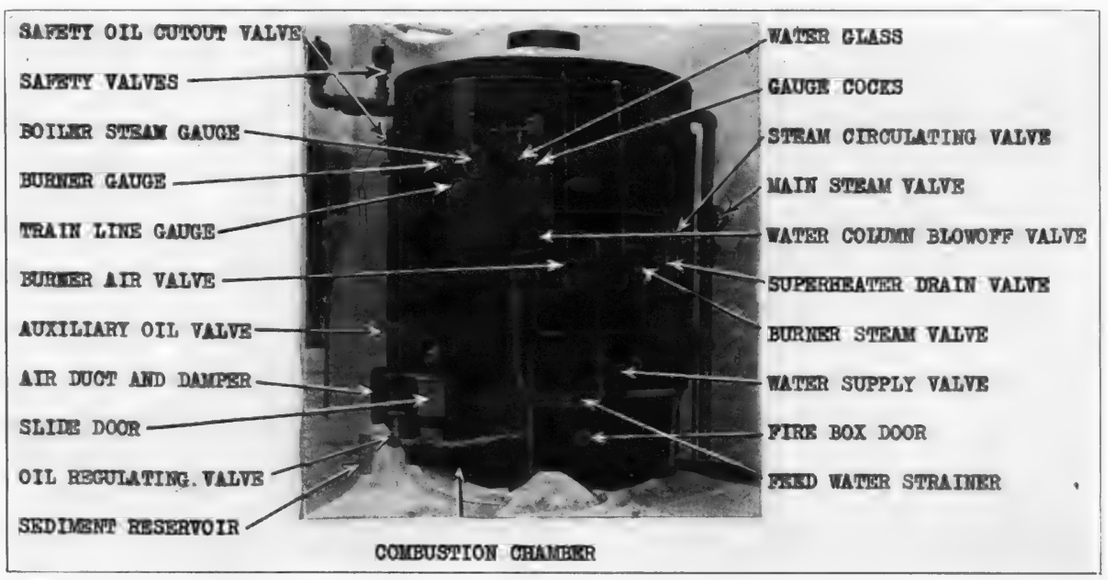
Steam for heating the cars on the New Haven is obtained from the locomotive, as it is on almost all railroads.

roads using electric locomotives but they did not prove successful.

Experiments are now being carried out to develop an electric boiler but none of this type is in daily use as a standard on electric locomotives in this country. Electric heaters, energized from the electric locomotives, are not used because the cars run in both steam and electric zones, which necessitates steam-radiator pipes in all cars; hence, to avoid duplication of equipment, steam is furnished in the electric zone.

THE TRAIN HEATING SYSTEM

All passenger electric locomotives carry a boiler, water tanks, oil burner, oil tanks, blower and air



Essential Parts and Auxiliaries of Specialized Heating Boiler Used on New York, New Haven and Hartford Railroad Locomotives

The problem of heating a train of cars drawn by a steam locomotive is simpler than the one of heating the same train when drawn by an electric locomotive. On the steam locomotive, there is a large quantity of steam at high pressure developed for the purpose of train propulsion, so some of it is taken for train heating. On the electric locomotive steam must be generated solely for train heating, so this means the addition of much apparatus that is not useful for traction.

Difficulty is experienced in locating the heating apparatus and electrical apparatus, due to the limited space available on a locomotive. Both the first cost of the locomotive and its maintenance expense are increased by the addition of the heating plant. The problem is further complicated on locomotives built to weight restrictions.

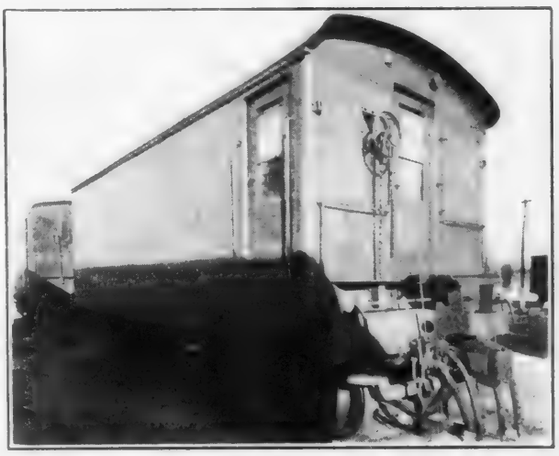
Up to the present time the oil-fired flash boiler has proved to be the best all-around steam generator for use on an electric locomotive. It has a large capacity per unit of volume and per unit of weight. It can be brought up to full pressure or shut off quickly. It is clean, economical, reliable and relatively cheap in first cost. Electric steam generators were tried on other rail-

compressor. The blower furnishes air for combustion, while the compressor furnishes air for atomization in starting. The fireman operates the boiler, which generates steam at a pressure of 95 lbs. per square inch gauge.

Steam passes from the boiler to the cars through a single pipe-line, connected between cars by rubber hose fitted with special railroad couplings and car-end valves. These make easy the coupling of cars when making-up trains. Cars are heated by radiator pipes run along the floor at the sides of the car. Steam is admitted to these radiators by valves operated by the trainmen. The valves sectionalize the radiator pipes so the number in use can be varied with the weather.

The quantity of steam admitted to the radiators is governed by a regulator located underneath the car floor. This takes steam from the train line at any pressure between 7 lbs. per square inch, the minimum permissible at the last car, up to the maximum used on the train line—which would be 95 lbs. approximately at the first car—and admits sufficient to maintain a pressure in radiators just slightly above atmosphere. This is the vapor system.

The regulator consists of a steam valve, a chamber containing a heat-sensitive liquid and a lever arrangement through which the diaphragm of the liquid chamber operates the valve. The regulator is so piped that steam first must pass through the regulator valve to get to the radiator inlet, and so that condensate must pass through the regulator from the radiator outlet. When steam reaches the liquid chamber, the admission valve is closed. When condensate reaches it, the admission valve is opened. The condensate is discharged at the regulator.



Heating Trailer Used with Freight Locomotives on Days of Heavy Traffic

TRAIN-LINE PRESSURES AND STEAM REQUIREMENTS

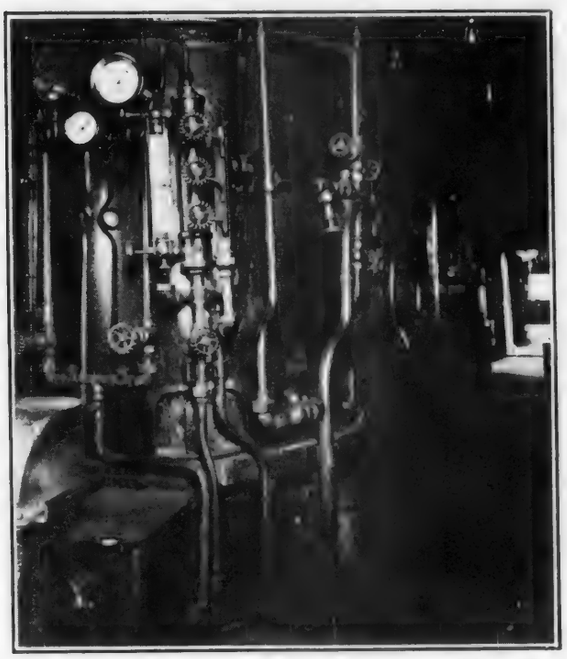
A boiler pressure of 95 lbs. per square inch or more is required to get sufficient steam back through 12 or 13 cars, because of the amount of steam required per car per hour, and the restricted size of the car-end connections. While the quantity varies with the temperature, speed of train, class of car, construction of car, regulator used, etc., it usually is between 200 and 300 lbs. per car per hour. With these figures in mind, it can be appreciated that a long fast train requires a large quantity of steam.

To get a satisfactory boiler to fit in an electric locomotive, within the space and weight limitations imposed, has been a difficult task. The New Haven has developed a special type of boiler which is meeting the requirements very well. This is built in two sizes to conform with the two sizes of electric passenger-locomotives in use.

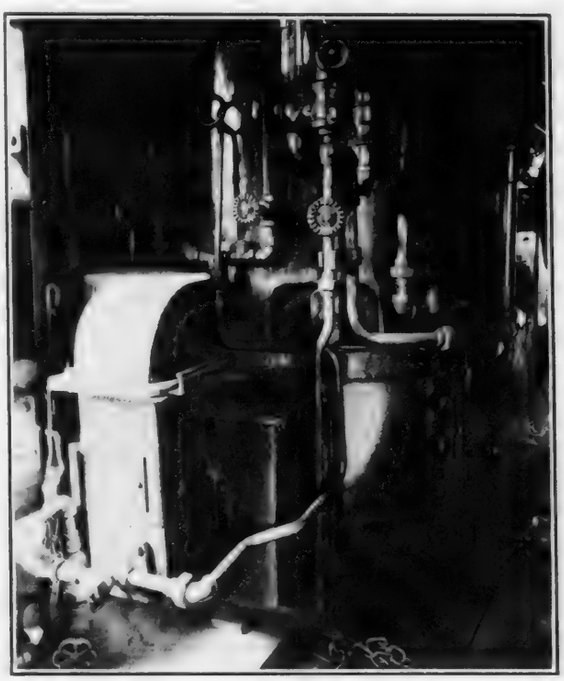
On passenger electric-locomotives, the complete generating plant is carried on the locomotive. In order to be able to use freight locomotives in passenger service on football days, at Christmas, New Year's and other holidays, to haul sections and extra trains, ten heating trailers were built for these locomotives. Each trailer carries 1,700 gal. of water and 400 gal. of oil. The boiler is rated at 4,000 lbs. of steam per hour, from and at 212° F. In severe weather the trailer, therefore, has water for three hours' service and oil for six hours. At lower rates of evaporation, this supply of course, would last longer. These trailers are unique since they are the only railroad equipment of this type in use in this country.

LIQUID FUEL AND WATER STATIONS

Locomotives and trailers are supplied with liquid fuel, water and other necessities at Stamford, New Haven, Cedar Hill and Danbury. At these points large storage tanks are located into which oil is pumped from tank cars. At Stamford and Danbury the tanks are underground, while at New Haven and Cedar Hill, they are above ground and



View of Oil-Fired Heating Boiler in Place in Electric Locomotive

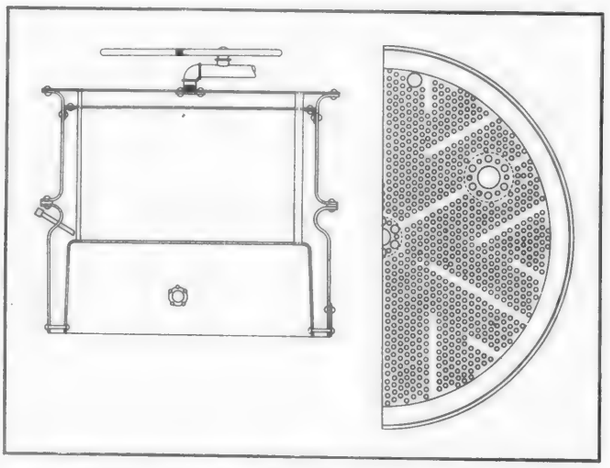


Close-Up View of Burner Chamber Showing Details of Piping

enclosed by mounds. The storage capacity is as follows: Stamford, 11,000 gal.; New Haven, 20,000 gal.; Cedar Hill, 15,000 gal. and Danbury, 13,000 gal. Oil is pumped from these tanks into the locomotive tanks by small electrically-driven rotary pumps.

Pipe lines run underground from the tanks to outlet boxes located 50 ft. apart along the storage tracks on which locomotives stand while awaiting service. Steam and water also are supplied at these boxes. Connection between the outlets and locomotives is by hose. The water tanks are filled by pressure from the railroad or city mains.

While the locomotive is standing on the terminal, awaiting service, the burner is shut off. During this time the heating plant is kept from freezing by connecting it to the yard steam-supply. Water, but not oil, is available at Oak Point and Grand Central Terminal in New York. The oil tanks, therefore, are made large enough to give a supply for a round trip. Since eleven times as much water as oil is required, and since water is available without installation of special facilities, the water tanks were designed for a single trip.



Construction of Boiler Shell and Detail of Tubing
The superheater, a flat spiral, is shown at the top

FUEL

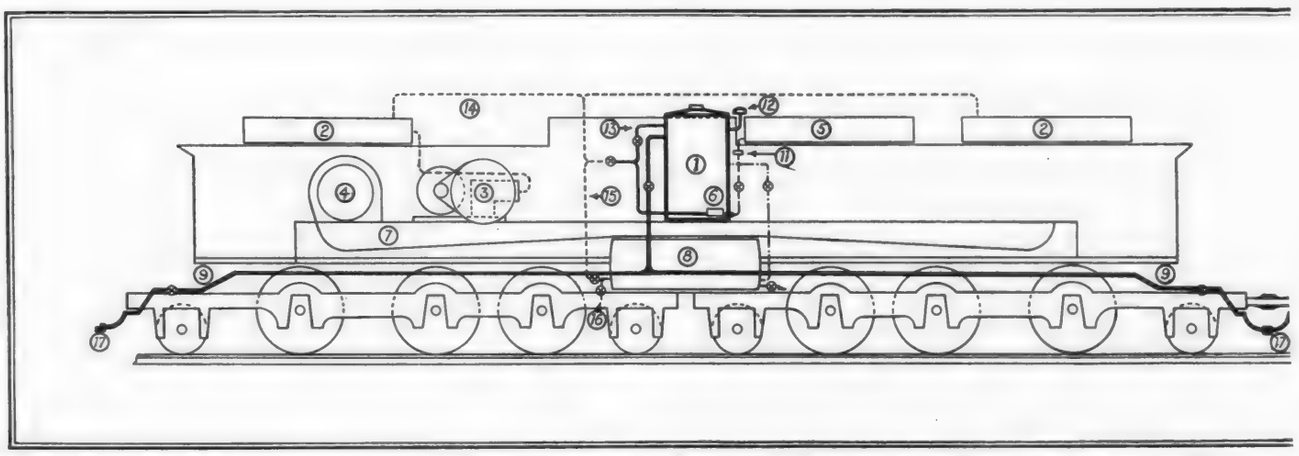
The liquid fuel at present in use is known as "off-color kerosene" or furnace oil. It is light in body, similar to kerosene. It ranges in color from a light to a dark straw. The heat value is 18,800 B.T.U. per lb. This has been in use several years. Previously a heavier oil a little cheaper in first cost was used but it was more difficult to burn without producing smoke and fumes, which were very objectionable to the crew and passengers. About 900,000 gal. is used during the heating season, which extends from the end of September, well into June, depending on the weather. The night and early morning cars and Pullman sleepers are the first to require heat in the fall and the last to be cut off in the early summer.

THE BOILER—GENERAL

The boiler is assembled in the shop as a complete unit, ready to go into the locomotive. It consists of the following parts: cast-iron base ring, including firebrick, burner and burner box; shell and tube assembly; a superheater—a flat spiral coil for furnishing superheated steam for the burner; a coping and stack to lead the exhaust gases out through the roof of the locomotive; lagging and jacket; two safety valves, gauges, control valves, cocks and water glass.

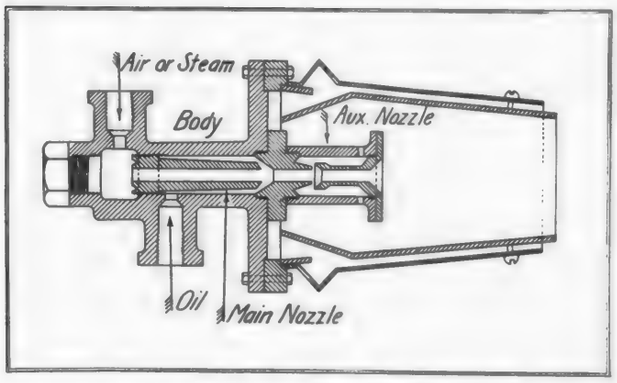
The boiler is of the vertical fire-tube type with water leg. It was especially designed to give a very great steam capacity for its size. This was necessary because of the limited space and weight allowed for it. It also was necessary that it be capable of attaining its full pressure and steaming capacity quickly, since the fire cannot be started until after the locomotive is out of the Park Avenue tunnel, at the New York terminal.

In cold weather this feature is very important, because it prevents cars from freezing. Full pressure can be obtained, starting cold, in ten minutes. Further, the boiler had to be made as dependable as possible so it would not be responsible for holding a valuable electric locomotive out of service while undergoing repairs.



Schematic Diagram of Heating System Used on New York, New Haven and Hartford

1—Boiler
2—Air Reservoir
3—Compressor
4—Blower
5—Oil Reservoir
6—Burner
7—Forced draft from blowers
8—Water tanks
9—Valves



Cross Section of One of the Oil-Burner Nozzles Used in Firing Heating Boilers on New Haven Electric Locomotives

DETAILS OF BOILER CONSTRUCTION

A brief general description of the boiler is as follows: The shell is made up of two courses of open-hearth steel, with bottom and top flue-sheets and a baffle plate of the same material. The baffle plate is located just below the top tube sheet. The purpose of the baffle is to insure the production of dry steam. The large boiler has 1,572 copper tubes, ⅝ in. outside diameter and 31 in. long, while the small boiler has 864 tubes ⅝ in. outside diameter, 28 in. long.

COPPER TUBES MAKE FOR LARGE STEAMING CAPACITY

The heating surface resulting from the large number of small tubes, so arranged that lanes are left to permit water circulation to the center of the tube sheet, is the means of obtaining the large steaming capacity which amounts to 4,000 lbs. per hour for the large boiler and 2,000 lbs. per hour for the small boiler.

The tubes are expanded over in both heads. The use of copper enables the tubes to be expanded or beaded in the heads better than steel. Copper tubes also minimize corrosion. To take care of the expansion of the tubes, the boiler shell is worked into an expansion loop. The method of fastening the top tube-sheet gives it flexibility. The water leg permits the injection of the feed water at a point other than on the hot tube sheet, aids circulation and forms a settling place for any scale or sediment where it readily can be washed out. There is one 2-in. tube in which is located a fusible plug to protect the boiler in case of low water.

The shell is set on a cast-iron base ring to which it is bolted. The fire-bricks are cemented into this ring to form the firebox. A special set of brick shapes has been developed covering the firebox sides and bottom. To line the whole box on sides and bottom only five differently-shaped bricks are required. Two other shapes line the burner chamber, making a total of seven differently-shaped bricks. The total number of all shapes used is fifteen. This is a substantial reduction from the number originally used.

THE BURNER

Many types of burners have been tried but only one is now being used for new installations and replacements. There are two others in use, one of which is experimental, having been put in service for trial only recently.

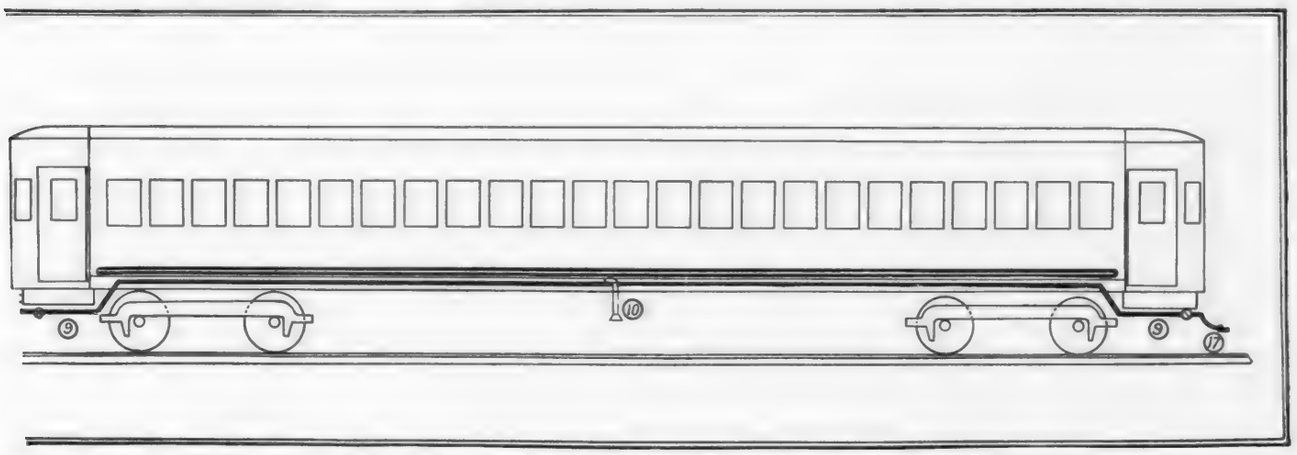
All burners in use are hand-regulated and of the continuous-burning type. Oil is fed to the burner by gravity from tanks on the roof, the amount being regulated by a needle valve. The amount of steam or air used for atomization is regulated by a globe valve. The amount of air supplied from the blowers for combustion is regulated by a damper.

The burner desired is the one which will give maximum boiler capacity, good combustion at light, intermediate and full load, and which will operate with the minimum of attention in firing and maintenance.

BOILER OPERATION

The burner is started by using compressed air for atomization until sufficient steam pressure

(*Continued on Page* 86)



Railroad Trains Within the New York Electric Zone

10—Vapor regulator
11—Safety cut-out valve
12—Safety valve
13—Steam from superheater coil to burner after boiler is steaming
14—Air to burner for starting boiler
15—Air pressure for feeding water to boiler
16—Water tank vent and overflow when filling
17—Steam Hose

H. L. Clute, Consulting Engineer — **St. George High School, Evanston, Ill.** — Joe W. McCarthy, Architect

Heating and Ventilating a Large Church School

Mechanical Equipment for a Million-Dollar Institution Accommodating 1000 Boys

THE heating and ventilating installation at St. George High School, Evanston, Ill., so well meets modern demands for flexibility of internal mechanical arrangements and automatic control, that they are discussed here with some detail to supply information on present trends in school ventilation. The school, founded by Cardinal Mundelein and conducted by the Christian Brothers, was built at a cost of $1,000,000 to accommodate 1000 boys. It is the largest Roman Catholic high school in the archdiocese. It has an expanse of 3000 sq. ft. of floor space in its library; 4500 sq. ft. in the cafeteria; and 9000 sq. ft. in the gymnasium. Three laboratories for the sciences are fully equipped with the most modern apparatus. There is a swimming pool 24 ft. by 60 ft.

The per pupil cost of $1000 for a school of this type, and the per cubic foot cost of $0.50 shows good planning and long-range economy in view of the materials and workmanship that have entered into the structure and the completeness of its teaching and service equipment.

The school was opened formally September 12, 1927, to the freshman classes only, but a four-year course is contemplated, and it is expected that the majority of student entries will be for the full four years of training.

VENTILATION EQUIPMENT IN SEPARATE UNITS

The development in St. George High School of an adequate ventilating system reflects the forethought for the boy that is the keynote of this school. The mechanical ventilation equipment is arranged for control in separate units so that free use of windows in one part of the building will not dislocate any other part of the system which may require the utmost of mechanical method for air control in kitchen, swimming-pool room, lockers, gymnasium, and showers. The recreational rooms are open to independent control when other rooms —as on holidays—are cut out of the circuit. A generous air supply, briskly circulated in shower and swimming-pool room, with forced extraction, prevents any humidity problem here.

The ventilation apparatus is arranged in two separate systems: System I, with five separate units of control, takes care of air supply to all rooms; and System E, with three control units, provides exhaust ventilation in swimming-pool room, kitchen, cafeteria, chemical laboratory, and classrooms. The detailed loads are as follows:

SYSTEM I-1

System I-1 supplies air to the gymnasium, locker and shower rooms. Tempered and filtered air is admitted through inlets in the ceilings of shower and locker rooms, and in the steel roof trusses of the gymnasium. This particular method of installation allows for the distribution of a great amount of air at rather a high velocity, the distance from the floor permitting the velocity to be dissipated before it reaches students at exercise or at play.

The equipment includes a fan propelled by a 7½-H.P. motor, 60-cycle, with capacity of 13,200 C.F.M. Air conditioner and fan are located in sub-basement, with air intake through the wall from stairway leading to sub-basement. All ventilating apparatus is under automatic control. This unit maintains a constant temperature of air delivered from fan, adjustable between 60° and 75° F. Separate thermostatic control for each unit is located in the swimming-pool room.

SYSTEMS I-2 AND I-3

Systems I-2 and I-3 are classroom supply units to south and north portions of the building, respectively, with fan, motor, and air-conditioning apparatus located in northeast and southeast corners of basement. These units supply filtered and tempered air for ventilation only, at a rate of 30 cu. ft. of air per minute per pupil. Classrooms are heated by direct radiation, operating on a vacuum system. Gravity ducts for exhaust extend to the attic space and reach the outside atmosphere by means of louvered and automatically-controlled ventilators to preserve an even flow of air.

Each of the systems is equipped with fan and 10-H.P. motor, one capable of delivering 16,600, and, the other, 17,300 C.F.M. Air intakes are through the wall of basement. Distributing mains are in the ceiling of the corridors in each system, and branch connections are at register faces close to the ceilings of the several rooms.

SYSTEMS I-4 AND I-5

Systems I-4 and I-5 constitute the two gravity fresh-air supply units which supply air to the swimming-pool room. The air comes through the heating unit into large ducts and risers located in the side walls of the room. This system is made operative by means of a large exhaust fan forming part of System E-1, drawing the air through the registers in the east wall of this room. This gives a very uniform air flow under conditions which call for special effort to obtain satisfactory control. Exhaust fan and motor are located in sub-basement and discharge is effected through the wall into an areaway. The equipment includes fan with 5-H.P. motor which, at 1800 R.P.M., has a capacity of 10,960 C.F.M.

SYSTEM E-2

System E-2 operates as an exhaust fan unit for the kitchen. The fan is direct-connected to a 1½-H.P. motor and exhausts 3000 C.F.M. through collecting ducts, discharge duct, and exhaust hood through the roof. The ventilation unit is mounted on a suspended platform. Direct connection is made to the kitchen range. Register spaces are placed in the wall between kitchen and cafeteria, and the air required by the fan to ventilate the kitchen is drawn out of the cafeteria by means of these openings. There is also a large supply inlet for the cafeteria.

Boiler Room, St. George High School, Showing Installation of Jones Oil Burners with Full Automatic Control

SYSTEM E-3

System E-3 provides gravity exhaust from classrooms and other ventilated rooms throughout, except the swimming-pool room and the kitchen. The equipment includes registers and collecting ducts leading to two trunk risers. The exhaust air finally is discharged through a louvered pent-house on the roof.

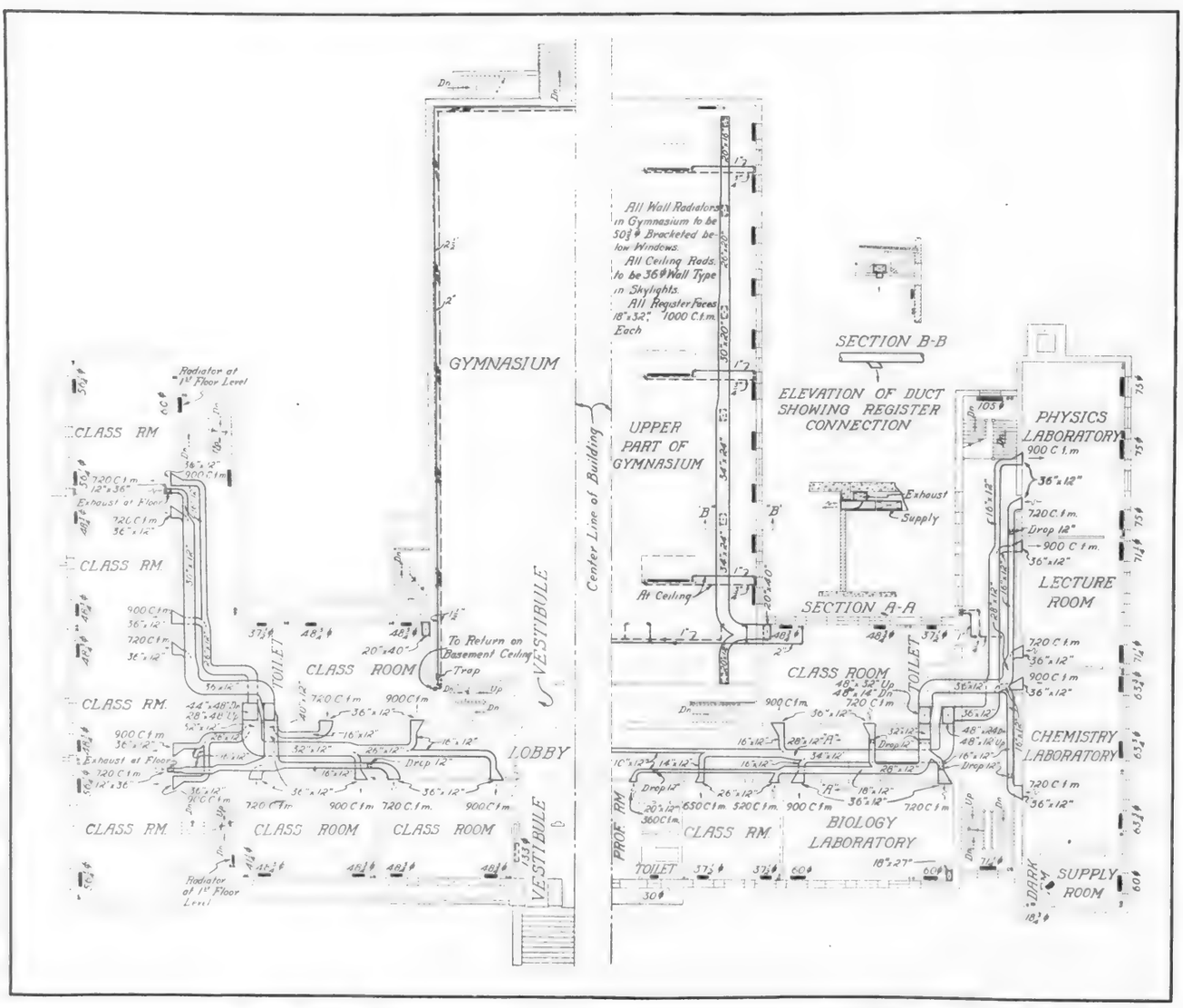
INDIVIDUAL DESK EXHAUSTS IN LABORATORY

The chemistry unit will bear special mention inasmuch as the air exhausts at each individual desk provide a degree of protection against poisonous fumes efficient to the last degree. The desks so equipped number thirty-two. Laboratory facilities and storage units, including specially-designed wall cabinets for chemicals and apparatus, will accommodate six classes per day or 32 pupils each. The chemistry teacher's research laboratory adjoining this room similarly is protected.

Fan motors throughout are of the 200-volt, 3-phase, 60-cycle type, 40-degrees rating. Automatic heat control is adjustable between 60° and 70° F. in Systems I-1, I-2, and I-3. Units I-4 and I-5 are adjustable between 70° and 80° F.

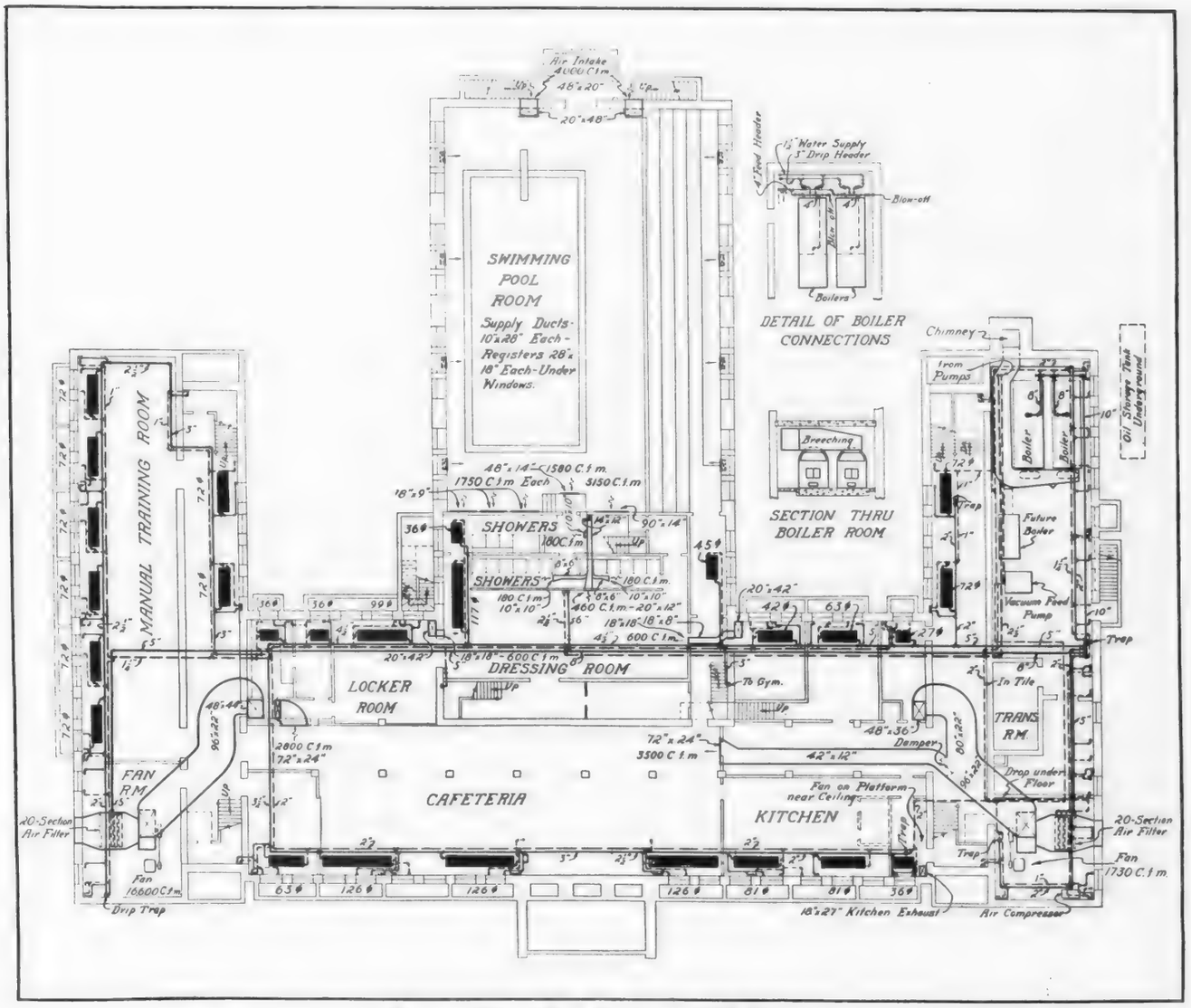
Massachusetts fans, Louis Allis motors, Duro filters, and Powers heat regulators are employed. The air filters are set up in sections. Each unit carries two extra cells, with tank for washing and tank for charging cells.

Air filter and tempering heater suitably are housed in 18-gauge galvanized-iron, reinforced with angle iron. The low-pressure heating system, installed by the Kinzie Engineering Company, is operated as a vacuum system. Direct radiation is supplied to rooms at a pressure not exceeding 1 lb. at the boiler. Two William Bros. boilers of the firebox type are used, with a load rating of 20,000 sq. ft. of radiation. Each boiler has 1711 sq. ft. of heating surface and 39.6 sq. ft. of grate area. The vacuum return system is maintained by two duplex vacuum feed pumps.



First Floor Plan
South Half

Second Floor Plan
North Half



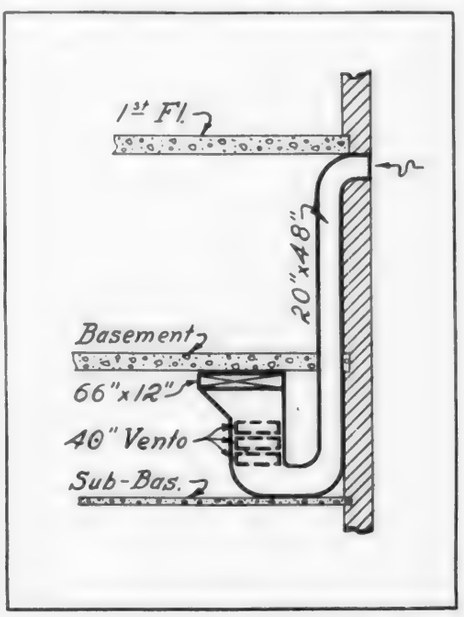
Basement Floor Plan, St. George High School

The ventilating system was installed by the R. B. Hayward Co., of Chicago.

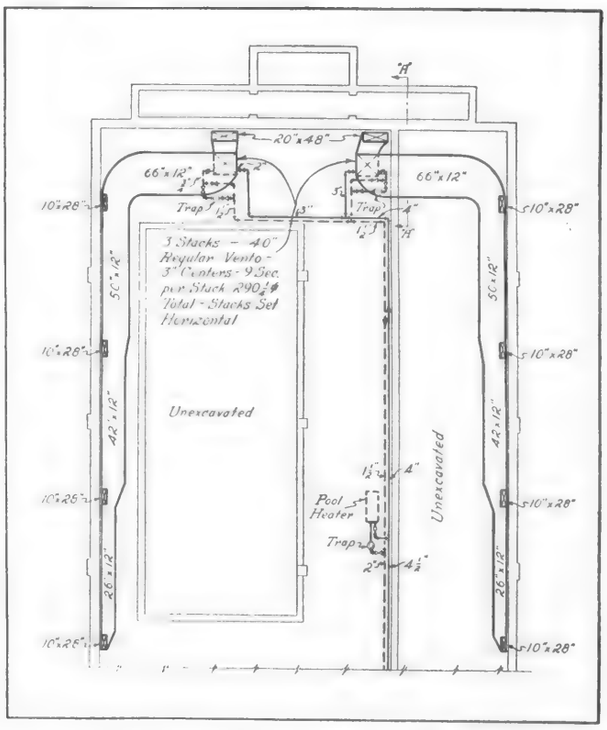
ARRANGEMENT OF DIRECT RADIATION

Three separate systems of radiation are arranged as follows: (1) One on sub-basement ceiling with sub-mains to supply all direct radiation, except in the north wing; (2) one to supply direct radiation to east half of north wing, and (3) one to supply direct radiation to the west half of north wing. Blast heaters and water heater for swimming pool room are supplied by a system of mains separate from those for general heating, with trunk return from one blast heater underground in tile.

The heating plant is equipped with a Jones oil-burning system which consists of electrically-driven air compressors and oil pumps. Burners are of the flat-flame, external-atomizing type, and the fan-shaped flame which spans the entire width of the boiler is fed by oil and air under pressure. Secondary air for combustion admitted through ports beneath the burner is preheated, and a very fine adjustment of automatic controls obviates the necessity of constant attention on the part of an



Section A-A of Sub-Basement Plan



Upper Part of Sub-Basement Plan

engineer. Preheating of air and oil fed to the burners is governed by the gravity and viscosity of the fuel oil which is used.

All of the radiators in basement rooms are of the cast-iron wall type, suspended at the ceiling. Other radiation is cast-iron of the sectional legless type, tapped top and bottom at opposite ends for vacuum operation. Radiators above the basement are carried on wall brackets above the floor. All radiator traps are of the thermostatic type. Water and blast heater traps likewise carry a venting by-pass trap which permits thermostatic control.

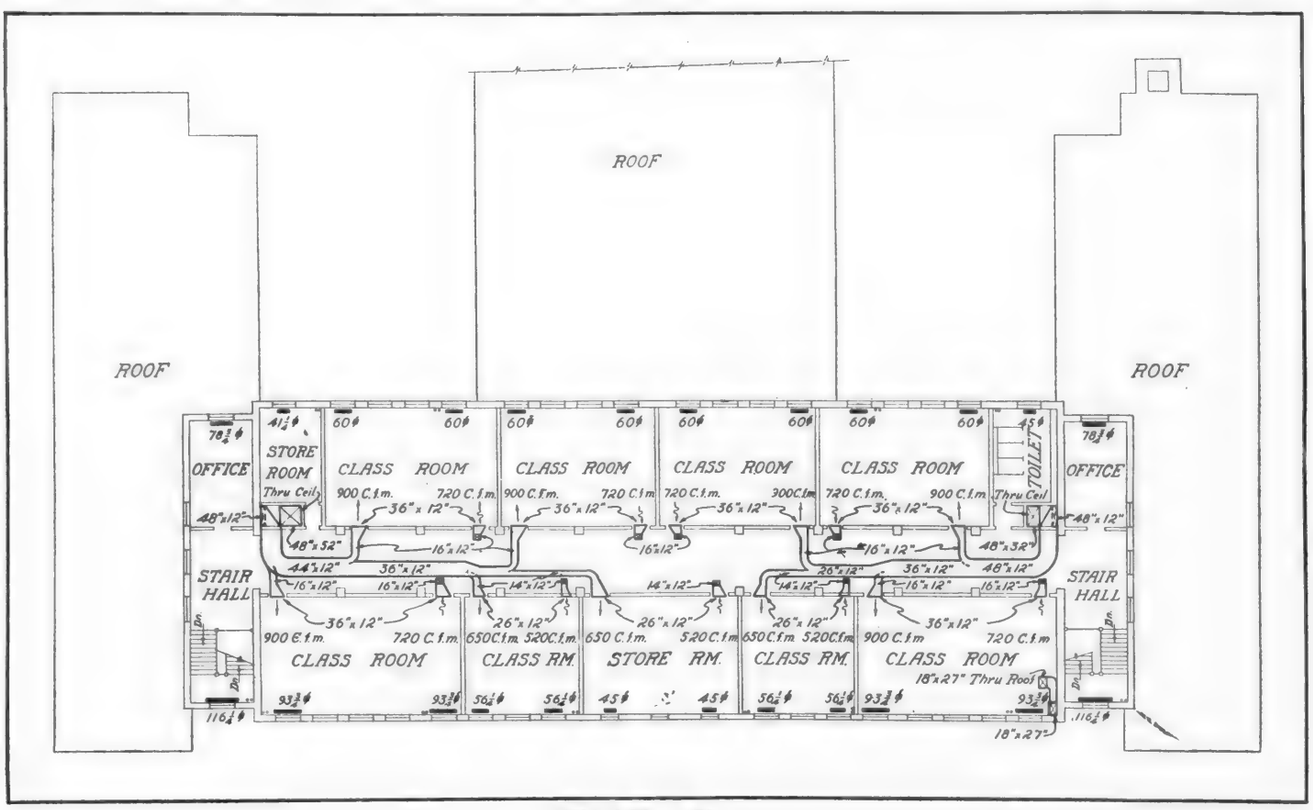
Joe W. McCarthy is the architect of the St. George High School, and H. L. Clute the consulting engineer.

Paris to Adopt Urban Central Heating System

THE Paris Municipal Council has decided to adopt the scheme of urban central heating which recently was proposed, and by which the buildings in an entire district will be heated from a central station and not by separate installations. In Germany the system already is widely used. It was installed in Dresden as long ago as 1900.

The work in Paris has been entrusted to a private constructor, who undertakes to begin the installation within one year and to lay at least six kilometers (3.7 miles) of mains, which will supply heat to 7000 flats within five years. The cost of the mains is estimated at about 8,000,000 francs ($320,000) per kilometer. The pipes will be laid in tunnels so as to facilitate repairs, and gas, electric and water mains will probably be transferred to the same tunnels, so that, in the future, interference with traffic will be reduced.

The disused power station of the Metropolitan Railway on the Quai de la Rapée will be the boilerhouse of the first system, which will extend to the Opera quarter. The constructor expects a degree of efficiency of fuel consumption of 70%.



Third Floor Plan

Combustion With Domestic Oil Burners

Design and Operation Can Only Be Successful When Fundamentals Are Understood and Maintained Inviolate

By R. T. Haslam
Standard Oil Development Company

Robert T. Haslam

ROBERT T. HASLAM, formerly professor of chemical engineering at the Massachusetts Institute of Technology, and in charge of its courses in gas and fuel engineering, is an international authority on matters pertaining to combustion. Professor Haslam only recently became associated, as manager of the Development Department, with the Standard Oil Development Company, a subsidiary organization of the Standard Oil Company (New Jersey). Professor Haslam and R. P. Russell are joint authors of "Fuels and Their Combustion," the standard treatise on this subject.

ALL outstanding innovations pass through a preliminary stage of development in which the major effort is to accomplish, in any manner whatsoever, the main objective. This is followed by a subsequent stage in which progress is toward constructional refinements, improved operation, and increased efficiency. Results of early efforts are apt to look crude and ill-fitted for the work at hand when they are viewed in retrospect.

The early automobile, for example, was scarcely more than a motor mounted on an old-fashioned buggy. Co-ordination of the various parts and the evolution of a four-wheeled vehicle or chassis suitable for automotive transportation was not brought about immediately. Refinements that later became necessities, such as electric starting and lighting and four-wheel brakes, did not come until years later. The first efforts had to be focused on the production of an automobile that would work with a fair degree of dependability, leaving efficiency and refinements until later.

Progress in domestic oil burning is a parallel case. The industry in general is, at this time, passing from the preliminary to the final stage of development, and from now on the attainment of efficiency, reliability, and quietness of operation—to a degree probably not even considered possible today—must be the aim of every manufacturer.

Although domestic oil burning is only in its infancy, progress has been rapid, as is shown by the consumption of oil for domestic heating, which has doubled in the past two years and is now in excess of 30,000,000 bbls. yearly. It is the purpose of this article to discuss the elementary but fundamental factors of combustion as affecting domestic oil burners, because in the confusion attending the birth of what we all hope will be a vast industry, many of the basic principles of combustion often have been overlooked.

The function of a domestic oil burner is to properly proportion and burn oil with the required quantity of air, cleanly and quietly, in such a manner that the heat so liberated can effectively be transferred to the surface of the boiler or warm-air furnace. Theoretically, a gallon of oil fuel requires approximately 1500 cu. ft. of air for combustion. Actually, however, more air than this is always used. The quantity of air, over that theoretically required, is called "excess air" and is always stated as the percentage of that theoretically required. For example, if a given burner is consuming 2700 cu. ft. of air per gallon of oil, then the burner is said to be operating with 80% excess air. Similarly, 150% excess air corresponds to the consumption of 3750 cu. ft. of air per gallon of oil.

Although all burners require some air in excess of that theoretically computed, the amount so needed should be kept to a minimum. In general, it may be said that a domestic burner functioning with 15% to 25% of excess air is operating quite satisfactorily in this respect. *Indeed, the minimum percentage of excess air required by different burners to burn a given quantity of oil smokelessly may be used as a measure of their relative efficiencies.*

THE SURPLUS OF EXCESS AIR SHOULD BE KEPT TO A MINIMUM

The tremendous importance of excess air in a domestic oil-burning installation is strongly brought out in a chart, Fig. 1, prepared by H. C. Hottel, of the Massachusetts Institute of Technology. This chart shows the effect of excess air on the efficiency of a domestic oil-burner installed in a simple hot-water heater, the fire-box of which is 24 in. in diameter and 3 ft. high. This chart represents a normal condition, namely, 1½ gal. of oil consumed in the furnace per hour. The top curve, marked "Total Heat Transmitted (Efficiency)," shows that when a burner requires only

20% of excess air for the smokeless combustion of 1½ gal. of oil per hour, the efficiency of the burner is approximately 80%, whereas if the same burner requires 200% of excess air for smokeless combustion the efficiency is only about 40%. In other words, *it takes about double the quantity of oil to heat a home with this size and type of furnace to a given temperature when using 200% of excess air as compared with the use of 20% of excess air.*

All will agree that any factor capable of changing, to this extent, the consumption of oil in a given installation should be given the greatest thought and attention, not only on the part of the manufacturer but by the installation crew as well. It is felt that the oil-burner industry as a whole is overlooking an effective tool for generally reducing the cost of oil heating (and thereby for making sales easier) by not using the Orsat gas-analysis apparatus for adjusting burners when they are installed. *The use of the Orsat gas-analysis apparatus should be considered just as necessary by the oil-burner man as the use of a level by the carpenter.*

It has been mentioned that a good oil burner should operate smokelessly with the use of approximately 20% of excess air. Tests made on a large number of domestic installations show that most of the better burners are using 50% to 75% of excess air, while a large number of the "best sellers" use not only 200% of excess air but even more.

With an adequate furnace and a burner requiring a small amount of excess air, *the direct cost of oil for automatic heating should be approximately the same as the cost of lump anthracite coal* in a similar hand-operated furnace. This is without making any allowance for the cost of firing the furnace or removing the ashes.

A STUDY OF HEAT-TRANSFER IN AN OIL-FIRED BOILER

To appreciate the reason why undue excess air is such an impediment to high efficiency and low oil consumption, it is necessary to review the means by which heat is transmitted from the oil flame to the walls of the furnace or boiler. The four methods by which heat may be transferred from hot gases to cold walls are:

1. Radiation from the flame due to its luminosity;
2. Direct radiation from the hot, or non-luminous, gases;
3. Convection, or the wiping of hot gases against the cold surfaces;
4. Re-radiation of heat from incandescent brick surfaces.

(1) In burning either liquid or gaseous hydrocarbons, combustion usually occurs in a flame of more or less luminosity, this luminosity being largely brought about through the formation of very finely divided carbon particles during the process of combustion. These tiny carbon particles are a very effective means of radiating heat from the flame to cold walls, and in some cases as much as one-third of the total heat picked up by the boiler may be transmitted from the flame by this method. When the conditions are such that the flame is non-luminous, or blue, transmission of heat in this way is largely eliminated. The designer of oil burners must weigh the advantage to be obtained through the use of a luminous flame from the standpoint of heat transfer against the tendency of such a flame to be noisy and to deposit soot. A good balance in this respect is possible.

(2) Until within a comparatively short time, radiation from the hot non-luminous gases, as they passed from the flame through the boiler setting, was not considered of any consequence. Now, however, it is recognized that this is an important factor. The quantity of heat transmitted by this means depends on: The temperature of the gases; the percentage of carbon dioxide and water vapor present, and the thickness of the gas layer passing over or in sight of the boiler surface.

In order to secure a high rate of heat transfer by this method it is necessary that the temperature of the gases be very high and that the per cent of carbon dioxide and water vapor be the maximum possible. The curve in Fig. 1 marked "Theoretical Flame Temperature" shows how rapidly the temperature of the flame falls as the per cent of excess air increases. Also, since carbon dioxide and water vapor are the only gases capable of radiating heat to the boiler surface (oxygen and nitrogen being ineffective), it is seen that there is a double reason

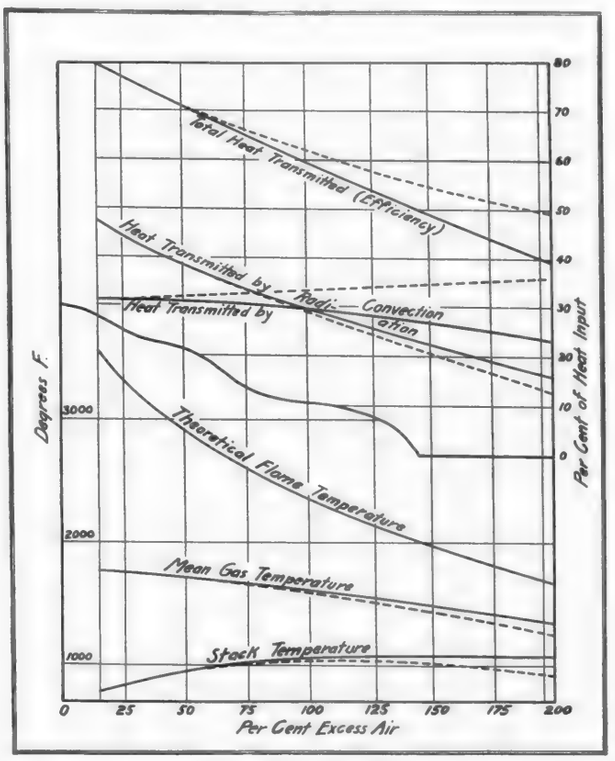


Fig. 1. Effect of Excess Air on Heat Transmission in Domestic Oil-Burning Furnace

The test from which these curves were obtained was made in a cylindrical combustion chamber 3 ft. high and 2 ft. in diameter, the heat-transfer surfaces being taken as the sides and top of this cylinder. Oil was consumed at a constant rate—1.5 gal. or 10.88 lbs. per hr., the fuel analysis showing 19,500 B.T.U. per lb.

why the heat transmitted by radiation falls rapidly with increasing excess air. This is illustrated in the curve marked "Heat Transmitted by Radiation," Fig. 1.

(3) The third manner in which heat can be transmitted to the boiler is by convection, or the direct contact of the turbulent hot gases with the boiler surface. The rate at which heat is transferred from the flame to the boiler surface by this means depends mainly upon the temperature, the velocity of the gases past the surfaces of the boiler, and the degree of turbulence. Increasing any of these factors increases the rate at which heat is transferred by convection. In view of the fact that gas velocity is increased with increasing excess air, the rate of heat transfer by convection does not drop off as rapidly, with increasing excess air, as does the heat transmitted by radiation. This may be seen in Fig. 1.

In furnaces designed for burning coal, the gas passages between the firebox and flue are usually short and of large cross-section. For coal-burning this condition is necessary, since these passages are apt to become foul with soot and fine ash, and therefore they must be ample in size and capable of being cleaned readily. Since efficient oil-burning should be practically smokeless, the passages between the fire-box and the stack in a boiler designed for burning oil should be both long and of small cross-section in order to improve the rate of heat transfer by convection. In some cases, when installing an oil burner in a domestic boiler designed for burning coal, it is possible to remedy the situation to some extent by closing up some of the ports in the dome nearest the stack so as to force the gases to take a somewhat more roundabout passage between the fire-box and the stack.

(4) While it is usually inadvisable to impinge a flame directly on water-cooled surfaces, it is often well to have the flame wipe a fire-brick surface. This surface rapidly becomes incandescent and radiates heat freely to all water-cooled surfaces in sight. Inasmuch as the quantity of heat thus radiated increases very rapidly with an increase in the temperature of the surface (actually as the fourth power of the temperature, that is, doubling the temperature of the brick surface increases the rate at which heat is radiated to the cool surfaces sixteen-fold), a relatively small amount of incandescent brick in a furnace is therefore often very helpful.

For some time to come a majority of oil burners probably will be installed in furnaces designed for burning coal. When coal is used as a fuel, over half of the heat transmitted to the domestic boiler is by radiation and conduction from the hot fuel bed itself.

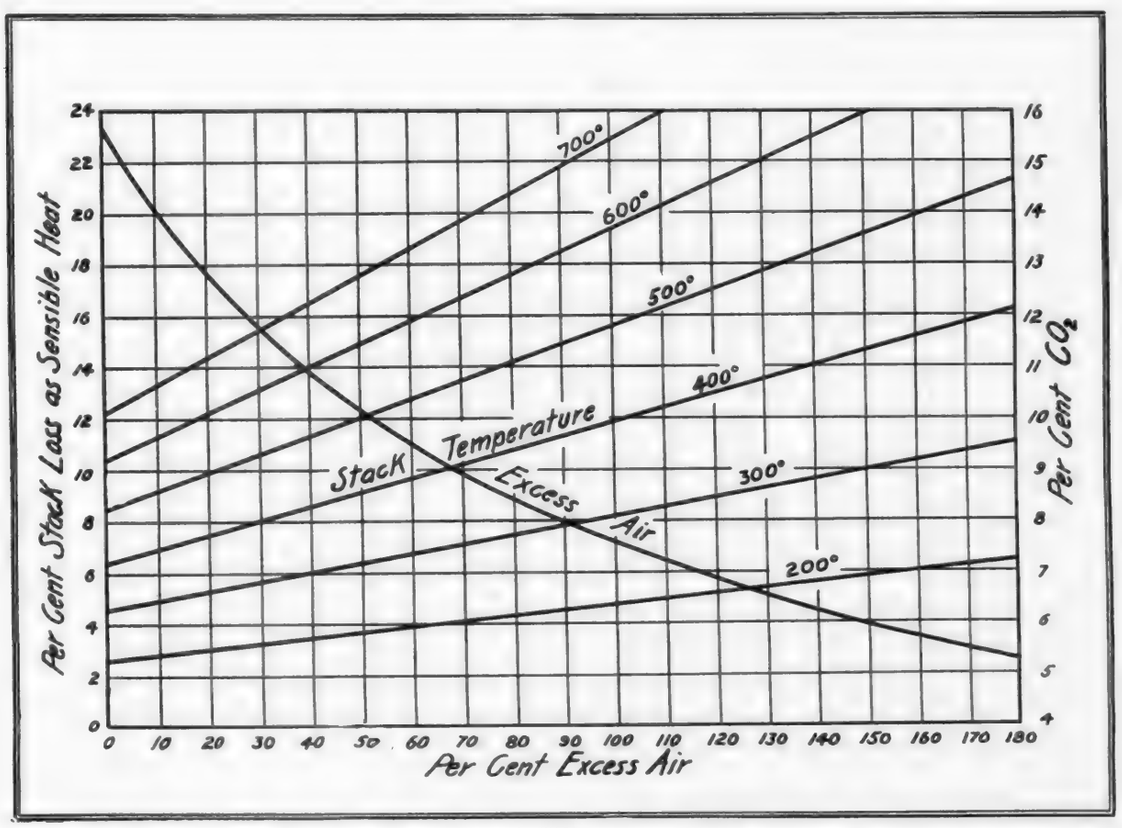


Fig. 2. Stack Loss as Sensible Heat Plotted Against Excess Air, and Excess Air Plotted Against CO_2 for Fuel Oil of 19,300 B.T.U. Heat Value

The stack loss due to heat of vaporization of water from burning hydrogen equals 6.8%.

The per cent of undeveloped heat loss due to CO equals $\frac{CO}{CO + CO_2} \times 44$

THE NEED FOR SPECIAL OIL-BURNING BOILERS

In view of the foregoing discussion, it will readily be appreciated that, when burning oil, a furnace must function in a very different manner than when solid fuel is used. Practically all of the load is thrown on the transfer of heat by either gaseous radiation or convection, instead of by radiation and conduction from the solid incandescent fuel bed.

As oil-burning becomes more highly developed, suitably designed boilers will be encountered more frequently than at present. It is largely due to the fact that oil burners must be installed in furnaces designed for burning coal that the stack temperature in oil-burning installations usually is high. It is apparent that the rate at which heat is transmitted from the oil flame and the resultant hot gases is therefore of particular importance as long as oil burners must be installed in furnaces designed for burning coal.

In view of the marked influence of excess air on the efficiency of domestic oil burners, it is well to examine briefly the methods by which this excess air may be kept at a minimum:

In the first place, the burner must permit the careful regulation of the relative quantities of both oil and air. In most cases no attention is paid to regulating the amount of air that the burner will use as the amount of oil consumed is changed. The proportion of air to oil should, of course, be as nearly correct as possible at all times.

Even if the burner properly proportions the oil and air, no good will result unless the two are thoroughly mixed, because, without adequate mixing, it will be necessary to readjust the burner to permit larger quantities of air to flow into the furnace if smoke is to be prevented. It is only by thorough mixing of the oil and air that smoke can be prevented with a small excess of air. To promote ease of mixing, it usually is necessary to break up the oil and air into fine streams. Thorough mixing also can be obtained by causing a stream or cone of air to impinge at an angle against a stream of atomized oil.

A high degree of turbulence at the point where the air and the oil first mix is of considerable importance. However, it is not sufficient that turbulence should be maintained at this point only. It is equally important that this turbulence should extend throughout the furnace, or until the combustion has been completed. *Turbulence within the furnace itself is just as important as turbulence at the burner nozzle.* Sometimes turbulence within the furnace can be improved by having the direction of firing take place from back to front, instead of from front to back, thus causing the flame to turn on itself in its passage through the fire-box to the stack.

The finer the subdivisions into which the oil is broken, the simpler is the problem of mixing. In the same way, if the oil is first vaporized, either wholly or in part, thorough mixing with the required air is more readily attained. The use of preheated air is, of course, highly advantageous. The main difficulty with its use in connection with domestic oil burners is that it usually is impossible to have preheated air when first starting, and it is at this time that it is most needed, since the fire-box and setting are cold.

If the flame is to burn smokelessly and with a small amount of excess air, it is necessary to hold the flame temperature at a maximum until the oil has been completely burned. Any chilling of the flame prior to complete combustion tends to produce soot. A high temperature can be maintained either by suitably enclosing the flame in a fire-brick chamber or by shielding the flame from the sight of an excessive area of water-backed surface. This can be accomplished by the use of a pot in which combustion largely takes place. In some cases a small fire-brick arch, built a short distance out from the nozzle of the burner, will greatly aid in maintaining the temperature of the flame until combustion has been well started.

To get the maximum advantage from a burner that requires only a small percentage of excess air, all possibilities for air infiltration around the furnace should be eliminated. Considerable quantities of air often leak in around doors in the base of the setting, and in cracks or in between joints in the boiler proper. All such leaks are of much more importance than leaks in the breaching, although these latter leaks are not negligible, particularly in case the draft is poor.

COMBUSTION-RATE A VITAL FACTOR

The efficiency of oil-burning is also largely dependent on the rate at which oil is burned in a given size of boiler, i.e., the gallons of oil per hour per square foot of heat-pick-up surface. The harder the boiler is forced, the lower the efficiency and the higher the stack temperature. Practically all domestic oil burners are of the intermittent type and are so installed that the rate at which oil is being burned when the burner is on is sufficient to keep the house warm on the coldest day ever expected. This means that, while the burner is on, the rate of firing is usually far in excess of that needed except for possibly one day a year. If maximum efficiency is to be obtained, it is highly desirable to permit the ready adjustment of the burner so that it normally can operate at a relatively low rate of oil feed and yet be capable, through a slight adjustment, of handling sufficient oil to take care of the coldest day. In all probability, this adjustment could, with satisfaction, be manually operated.

Fig. 2 is a chart for rapidly determining excess air when the per cent of carbon dioxide in the stack gases is known, and also the sensible heat loss up the stack when the percentage of carbon dioxide and temperature of the stack gases are known. The method of using this chart is to start with the percentage of CO_2 on the right, pass horizontally to the line marked "excess air," then vertically to the proper stack temperature line, and then horizontally to the left, reading the percentage of sensible heat loss up the stack.

Heating and Ventilation Specifications

Building Up a Comprehensive and Concise Document to Fit All Classes of Contracts

By Harold L. Alt

IT is the purpose, in this series, to develop the structure of a representative set of specifications, clause by clause, to compare these, and to suggest the briefest and clearest wording to cover the ground.

It is hoped that these suggestions will lead to the adoption of a higher character of phraseology than often is encountered in specifications.

Mr. Alt has had an extensive experience in the preparation of specifications for heating and ventilation work, both here and abroad.

PREPARING specifications is one of the most exacting elements of modern engineering work. The specification is an instrument to round out the drawings which constitute the design, and to incorporate various items of information which the drawings, by their very nature, cannot suitably convey. Specifications become part of the contract with the drawings, and their subsequent influence on activities and on contractor-client relations is almost as important.

In general, the specification primarily recounts how the work shall be done and the quality of material to be employed; numerous other desirable instructions are included for the contractor's information, but the two items mentioned are the real purpose of this instrument. The drawing may call for "brick" or indicate "pipe" of a certain size, but the specification must tell what kind of brick or what make of pipe is to be used and how the brick is to be laid or how the pipe is to be installed.

An indication of a good specification is brevity. A specification should read as easily and smoothly as a well written story—for the specification is a literary production and one of the most difficult to compose, involving as it does a depiction of the job before it is begun and notes on every detail which later will enter into the proposition. A certain legal aspect also must be considered and the phraseology must be such that no misinterpretation reasonably is possible. The use of pronouns is allowable to only a limited extent, and in all cases the person or persons to whom pronouns refer must be unmistakable.

In view of possible legal action later arising on account of the contract, the clearness of the specification should leave no room for argument and, in fact, the clearer the specification, the less likelihood of any controversy arising over it. Thus it will be seen that a specification allowing only one construction to be placed on it insures the contractor *against* having a more expensive job thrust on him than he has figured, *protects* the owner from lawsuits and from getting less than he is paying for, and, in case a legal action *should* arise, shows that the engineer made every effort to set down just what both parties to the contract intended when they signed the contract.

In this series of articles the specifications considered will be those related to heating, ventilating and air conditioning only, and, when completed, a basic specification for any reasonable set of contingencies will have been formulated.

There is such a thing as carrying brevity too far; witness a specification that covered a six-story building and all work necessary therefor. The section relating to the heating consisted of the following:

"The contractor shall provide an adequate system of steam heating for the building."

This is every word that was contained in the entire specification in regard to the heating and yet actually it covered a great deal of ground. "The contractor must provide" put the heating contract up to the general contractor; "an adequate system" made it necessary for him to install whatever might be required, in that locality, for a proper temperature rise for comfort; "of steam heating" designated the heating medium to be used, and, "for the building" made it obvious that heating was to be provided for the entire building.

It must not be assumed that this was an adequate and desirable form of specification, but it does indicate what can be compressed into a few words, and many specifications covering several pages can be found where all the information included in that one sentenced is not to be found. Some specification writers have an entirely wrong method of attacking the preparation of a specification. Their general conditions are incomplete and vague; their specification of materials and labor is slurred over; but a great deal of time is spent in describing how the steam main starts off from the boiler, with such a size, extends to such a point, where it divides into two mains of such a size, that one main is carried from this location to another point where it splits into two lines of another size, and so on.

This is all wrong and a useless duplication; the drawings should clearly indicate where the piping runs and the sizes at various points. It is manifestly impossible to follow this practice until the last radiator connection has been specified, so why begin it? Moreover, such a scheme, when carefully gone over, almost invariably will indicate a point where the sizes will be left off drawings—the draftsman depending on the specifications—and the specifications will fail to state the sizes, it being assumed that these are on the drawings. Between the two the sizes are omitted and the whole purpose of the plans and specifications is defeated.

It has been the writer's experience that the specification which *gives no pipe sizes and details no runs of pipe* is the one which will contain the fewest conflicts with the plans. Such items as the schedule of sizes of connections to the individual radiators, and sizes of radiator valves may well be included, *but even these are better if placed in a table on the plans.*

It must be remembered that the installation man will carry a roll of plans around with him over the job while the work is going in, but seldom indeed is he found with a set of specifications in his pocket. He reads the specifications over from time to time, it is true, but *when the work goes in he uses the plans and trusts largely to his memory for the information in the specifications.* For this reason it is most practical to place on the drawings all information necessary in the putting up of the piping and to leave to the specifications information of a general nature or which is necessary only in ordering material.

SPECIFICATIONS WHICH WITH THE ACCOMPANYING PLANS COVER

THE INSTALLATION OF

A COMPLETE SYSTEM OF HEATING AND VENTILATION TO BE INSTALLED

IN

BLANK BUILDING

Located at the Corner of Smith and Jones Streets, Utica, N. Y.

for

John Doe, Owner

(Address)

Brown and Green, Architects

(Address)

Black and White, Engineers

(Address)

Date _____ Copy No. ___of_____Copies

Fig. 1. Typical Set-Up for Title Page for Heating Specifications

Some specification writers have realized this fact but have applied it to too great an extent, trying to put on the plans almost the entire specification outside of the general conditions and methods of payment. This is almost as bad as the other extreme, for it confuses the plans and submerges the important parts of the layout in a mass of notes and lettering so that clearness is sacrificed and the man in the field has more difficulty in tracing out his lines and sizes than if the drawing were free from these details. It is largely a matter of good judgment where to stop on the plans and where to begin in the specifications; but, wherever the point is selected, care should be taken that the specifications go on from the place where the plans leave off and that duplication and overlapping are avoided.

PROVIDING FOR ALTERATIONS

Still another objection to including items in the specifications which are already indicated on the drawings is the fact that frequently last-minute changes require alterations that can be made on the plans without difficulty, but if this same information also has been placed in the specifications then they must be, to that extent, rewritten. In general it will be found useful, not only for brevity, but also for the purpose of permitting alterations without vitiating the specifications, to use the phrase, "as shown on plans." Thus it may be said that "piping is run as shown on the plans" or the "radiators are connected up as shown on plans" or "as shown in the detail on plans," leaving it possible to make almost any reasonable change in the scheme without changing the specifications.

A specification has certain general divisions which should be kept separate and distinct. A poor specification writer will always betray himself by an incorrect segregation of his provisions; for instance, he will specify the kind of pipe to be used in his general conditions, or he will list fans with the steam heating, or he will specify the boiler in one place, the boiler trimmings a few pages along and the smoke breeching at the end. This not only makes the specification difficult to refer to for information, but also leaves it hard to check up for omissions or items forgotten, because there is no logical order or sequence to the instrument.

The general divisions of a specification and the order in which they should be placed are:

(a) General Conditions
(b) Special Conditions
(c) Description of System
(d) Material and Labor Specification
(e) Detailed Specification by Items
(f) Conclusion

Naturally these general divisions may be expanded into sub-items, but good judgment must be used in placing the sub-items in the proper and logical general division. For instance, in general

conditions would be included such items as Superintendence, Co-operation, Payments, Proposals, Methods of Payment, and so on; in special conditions would be included such items as are of a general nature *but relating to the heating contract only*, these being represented by such provisions relating to Temporary Heat, Coal for Testing, Tests of the Heating Piping and similar classifications.

Under the Material and Labor Specification may be included the subjects of Quality of Materials and Standards of Workmanship, such as Pipe, Fittings, Valves, Reaming, Pitching, Hangers and similar general paragraphs covering this phase of the subject. The General Description should include a brief outline of the installation, how it is to operate and what it is to accomplish; unfortunately, many specifications are turned out which, after careful reading, do not definitely indicate the type of heating system they are supposed to specify or how it is expected to be operated.

The specification by items may be considered as the real body of the specification and should take the whole installation, item by item, giving a short, clear and specific description of what is desired. Such items as the Radiators, Boilers, Fans, Motors, Grilles, and so on, should appear in this section. The conclusion should round off the specification with any matters not covered by the above and some writers use this part of the specification to cover Tests, Blowing Out the System, Painting, Cleaning Up Debris, and other matters of similar nature, such as the Charts for Valves, Operating Instructions for Owner, and the like.

BASIC IDEAS UNDERLYING ALL SPECIFICATIONS

In the preparation of all specifications there are certain fundamental assumptions which serve as a foundation upon which to construct the whole instrument. One of these is that the contractor is pre-supposed to be thoroughly familiar with the class of work on which he is figuring, and to know what is necessary to make a proper and first-class job, according to the best practices of the trade. Therefore, it is at once put up to the contractor not to try to take advantage of any loophole which may exist, in either the plans or specifications, to sidestep anything which is necessary or required to make a complete and finished job ready to operate. We all know that the contractor is not always as conversant with every type of heating and ventilating system as he might be but, nevertheless he, of necessity, is held to be well versed in the common and practical end of the work. On this account some specifications call for the contractor to check the specifications and plans for errors or any other difficulties which he may discover, and really make him a co-partner with the designer in passing on the practicality of the proposed installation. After having thus passed on the layout he assumes automatically a certain amount of responsibility for any difficulties which may develop later.

HAZARD OF CONTRACTING

It is a well-known fact that contracting is, in a way, a hazardous and uncertain business; it is quite different from selling an article over a counter for which a known price has been paid and for which a set selling price can be made. The contractor *contracts for future delivery* and in so doing obligates himself to absorb all contingencies of an unforeseen nature which may arise. He must pay his labor an amount which can only be approximated; he must buy material *after* signing the contract and take a chance on being able to get as good a price as was given him at the time of making his estimate of his cost. For this reason every contractor must make an allowance for contingencies and he is expected to make this sufficient to cover ALL contingencies.

The owner, on the other hand, is building something on which a certain cost price must be met in order to secure a suitable return on the investment and consequently he is proceeding on a much closer margin and with less chance of profit. The owner takes no chances on the contract in any way, shape or manner, if possible, to avoid it; he pays the contractor not only to make his installation but to assume all liabilities in connection with the construction. So, when anything happens, it's the contractor's funeral and not the owner's, although if the matter is a serious one the owner can hardly escape entirely, no matter how well he may be protected by his specifications. Even a delay in completion is likely to cause an owner a great and serious loss. More than this, the contractor is the one who gets the bulk of the money spent on a construction job, the engineer and architect getting only a comparatively small percentage of the contractor's sum and, as a result, the contractor is the logical one to stand the racket if anything unexpected turns up.

NUMBERING PARAGRAPHS

Every specification should have the paragraphs numbered for ready reference, and it is simpler to start these numbers at the beginning of each section rather than to try to run them consecutively all through the specification. Thus, if the section with the general conditions is called "Section I" then each paragraph under this section will carry numbers running from 1 up, to the end of the section, and they may be referred to as Section I, Par. 4, and Section I, Par. 10. Another method is to use the initials of the section to precede the paragraph number, this resulting in the paragraphs in the general conditions section taking the prefix GC and the first paragraph would be GC 1, and the second paragraph would be GC 2, and so on. When Special Conditions are reached the first paragraph would be SC 1, the second SC 2, etc. This gives an opportunity to add paragraphs in any section at any time without destroying the series and without the use of additional letters or other makeshift devices to designate the new paragraphs.

TITLE PAGES AND INDEX

Every specification should have a title page on the outside and an index immediately following, in which the headings of each paragraph should be arranged in alphabetical order, with the page number following, so that instant reference can be made to any paragraph in the entire specification. The title page should state what the specification covers, where the building is located, the owner's name, the architect's name, the engineer's name, the date, how many copies have been prepared and the number of each copy. Fig. 1 (p. 84) shows a typical set-up for a title page for ordinary work.

SUBJECTS USUALLY COVERED IN GENERAL CONDITIONS

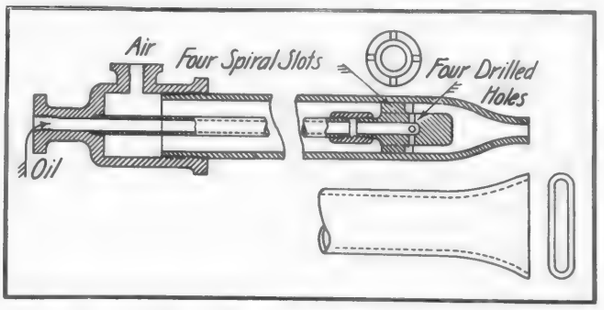
In the "General Conditions" portion of the specifications the following subjects are usually considered either whole or in part.

(1) Proposals
(2) Deposit (if any) and Bond
(3) Return of Deposit (if any) and Forfeit
(4) List of Materials and Apparatus
(5) Form of Proposal
(6) Schedule of Manufacturers and Sub-contractors
(7) Unit Prices
(8) Rights Reserved
(9) Definitions
(10) Approval of Materials and Work
(11) Drawings
(12) Shop Drawings
(13) Discrepancies
(14) Verbal Instructions
(15) Patents
(16) Fees and Charges
(17) Ordinances and Laws
(18) Fire Insurance
(19) Accident and Liability Insurance
(20) Protection of Work
(21) Storage
(22) Rubbish
(23) Time of Completion
(24) Schedule of Progress
(25) Payments
(26) Statement of Costs
(27) Liens
(28) Samples
(29) Changes in Materials
(30) Guarantee
(31) Scope of Specifications
(32) Employees

12,000,000 Railroad Passengers Served by Oil Heat

(*Continued from Page 73*)

(70 lbs.) is available for operation on steam. Feed water is forced into the boiler by compressed-air pressure on the water in the tanks. The flow is adjusted by a globe valve. Three gauges are used. One shows boiler steam-pressure, the second burner steam-or-air-pressure, while the third shows train-line steam-pressure.



Cross Section of an Oil-Burner Nozzle Used in Firing Heating Boilers on New Haven Electric Locomotives

A badge plate on the boiler shows the lowest permissible water line, while the usual water glass and try cocks show the water level carried in the boiler. A peep hole in the fire-box and a slide in the burner chamber enable the fireman to observe the burner performance. The output of the boiler is varied by regulating the oil, combustion air and burner atomizing-air or steam.

BOILER MAINTENANCE

Every month the boilers on the locomotives are washed out and examined. Special connections, piping and hand holes have been arranged so this can readily be done while they are in place in the locomotive, without injury to the electrical apparatus, and also to make thorough the washing out.

This monthly washing is a requirement of the Bureau of Locomotive Inspection of the Interstate Commerce Commission. The quality of the water in New York and Connecticut is exceptionally good, hence it causes a minimum of trouble.

Periodically, the boilers are brought into Van Nest Shop for repairs. Here they are dismantled, thoroughly cleaned, repaired and inspected. Boilers are retubed, relagged, new firebrick applied and all valves, fittings, etc., repaired or replaced. Periodically, they are hydrostatically tested. Each boiler is numbered and a record is kept of its washing, repairs, changes in construction, if any, etc.

The boiler was designed and developed by the New Haven Railroad and is built by the Otis Boiler Company.

CONCLUSION

When it is realized that passengers expect trains to be run, and run on time, with the cars nicely heated despite the temperature or the weather, and since trains are not permitted to leave a terminal until it is known beyond doubt that the steam-heating system is working properly, it can be appreciated that liberal margins in heating capacity of the equipment on the locomotive, in the cars and at the terminal must be assured. Further, the equipment must be simple to operate and easily understood and maintained.

While the system, as it now stands, after twenty-one years of development, is a good workable one, improvements are constantly being made.

The Future of District Steam Heating

FEW persons to-day would consider installing their own gas plants; no one would consider it practical to undertake his own water supply, except where there is no other supply available; and not a great many would be receptive even to trying to run their own electric generating plants. Yet when it comes to heat there is a sudden reversal of opinion—why?

To a great extent supplying one's own heat is a habit and one which will be hard to break. Yet we buy our water, our gas, our electricity; why, then, do we not buy our steam? Of course, there are many localities where there is no steam available for purchase and that is one answer; yet, wherever a good bona fide demand for anything exists, there always is someone with business ability enough to step into the breach and supply the demand. If we admit that this is true it naturally leads us to the conclusion that the demand really doesn't exist or else that the demand is not strong enough to cause a serious effort to be made toward supplying it.

As a result, district heating, to a large extent, has been confined to downtown business sections of certain cities where a big heating load can be secured within a comparatively small area. Now, regardless of how advantageous this may be from the financial return standpoint, it is not meeting the situation in the way offered by the possibilities in district heating. That it has not done so thus far is due largely to the fact that the average small house-owner does not realize how convenient it would be to employ district heating in his home, or else he does not know how to go about it to secure such a supply, even if he realizes the advantages.

Whether the future district steam heating plant is going to be a municipal proposition, a co-operative community affair, or whether it will be supplied and run by private companies for profit remains to be seen; the indications would seem to point toward the last solution as the most probable. In the first place, municipalities seldom seem able to carry on any business proposition in an economical and efficient manner; that is, not as economically and efficiently as a private concern. With a community outfit there are not only likely to be too many fingers in the pie, but also proper means of financing are likely to be lacking. In most cases it looks like a public service proposition.

Neither is district steam heating likely to develop as a cheaper proposition. There are many expenses in connection with the building and operation of a district steam company installation that are purely chargeable to the means employed to supply steam and which are unavoidable in this type of service. True, there are also economies which help to balance these expenses but, unfortunately, the economies are not quite sufficient to counterbalance the extra costs. Therefore, it must not be expected that district steam heating will come into its own through being a cheaper source of supply than the individual heating plant.

For the average home-owner the main advantages of district steam heating may be enumerated as follows:

1. Saves the cost of a boiler to heat the house and the labor of installing same.
2. Saves the cost of a special foundation for the boiler.
3. Saves the cost of a chimney for the boiler.
4. Saves the cost of providing storage for fuel.
5. Saves the cost—if any—for ash removal, stoking, and looking after the fire.
6. Permits the entire cellar to be kept clean and made available for any use which may be found for it.
7. Owner can go away for a day or a week and shut up his house with the assurance that when he returns everything will not be frozen up and a lot of damage done to his plumbing.
8. Avoids burning coal on mild days when owner is afraid to let his fire go out.
9. Avoids the disagreeable job of rebuilding the fire when it goes out for any reason.

Now, it would seem that with all these desirable features the ony undesirable one of a little higher cost, because of greater quantity used, would not make much difference. In fact, we have the same proposition as with the motor car. At first, a car was considered a wild extravagance and a dangerous method of locomotion. Yet how many, after having once driven a car, have ever given it up? And automobiles were never noted for being cheap, either in first cost or upkeep, but they certainly are convenient and owing to their convenience they are multiplying without end. We haven't been educated up to district steam—that's all!

The average apartment house is nothing but a community steam plant and when we get two or more apartments supplied from one heating plant we are well on the way to district heating. "Group building" heating, such as that practiced in many group building installations, is nothing but district heating on a small scale in which the owner runs his own district heating plant.

There seems little doubt that the future big building will employ district steam wherever such is available. As for the residential problem, a community heating plant in each city block or district undoubtedly is going to be the answer.

This is the first of a series of articles on district steam heating. Following articles will discuss the progress being made in different sections of the country in this branch of the heating industry.

PIPECRAFT

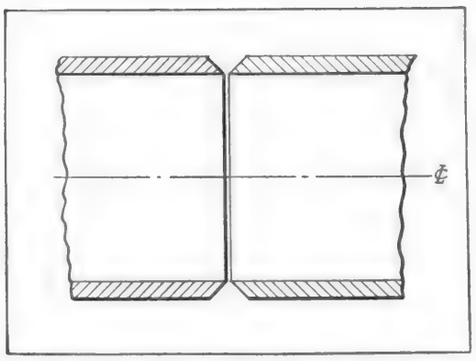


Fig. 87. Pipe Prepared for Welding

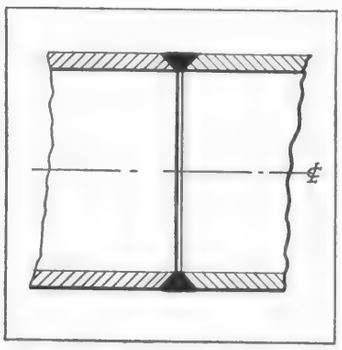


Fig. 88. Flat or Smooth Weld

XII—Welding for Heating Plants

WELDING by electricity or oxy-acetylene is a recent development in pipe work of interest to the heating contractor. Electric welding seems to be proving more popular for shop work and oxy-acetylene welding for field operations. This may be due to some extent to the facility with which the oxygen and acetylene tanks may be transported to and around the job and to the simplicity of the oxy-acetylene blow torch used. In the shop, however, welding work is generally carried on in some localized area in which electric service of proper character easily can be provided.

In the field the same condition does not exist. Often the electric service is not available when the job is first started; the locations where the work is to be done are far apart and often no two welds come in the same location. As a result, as soon as one weld is completed the apparatus must be shifted to the next place where the work is ready for the welder. Thus, in field work, welding follows the installation but, in shop work, the installation is brought to the welder and he does not move from the strategic position where he is installed with all his electric welding tools and service arranged to the best advantage.

Field welding is proving a great aid to the contractor who is up-to-date enough to employ it; erection is facilitated, nozzles and drip tappings may be welded at any time and in any place the contractor pleases; the only limitation is the fact that so far such welding has not successfully been employed on cast iron. As a result certain readjustments have become necessary in the design of piping systems as is evidenced by the location of drips. Where they formerly were taken off by bosses, usually located on some convenient fitting, with a welded installation the drips may be located at any desirable point on the line as long as they come in a section of steel pipe. Where it is advantageous to drip from a fitting this still is quite possible, but in the past many drips have been located more in regard to the location of fittings than in regard to the best point of dripping the line.

Technique of Welding a Pipe Line

To weld a pipe properly on the job, the ends of pipe should be beveled to an angle of 45°, as illustrated in Fig. 87. These ends then are brought close together and the weld made by fusing a soft steel filler of suitable welding composition into the "V" notch formed by the pipe ends. Some welders make their joints with what is known as the "smooth" or straight joint. This means that, when finished, the thickness of the weld is no greater than the wall of the pipe and the joint appears as in Fig. 88. Other welders use what is known as the "built-up" joint in which the process begun in Fig. 88 is carried on until the weld shows a thickness considerably in excess of the pipe shell, in the manner given in Fig. 89. This type of joint naturally is much stronger, due to the greater thickness of metal.

The weld depends for its strength on the cohesion between the welding material and the ends of the pipe. With the plain joint there is an added surface around the outside of the shell of the pipe providing for greater cohesion. It is customary when welding straight lengths of pipe to "tack" the weld in three to six places around the pipe (according to the size) and then weld between the tacks until the weld meets the tack, at which time the tack is reheated and welded in with the rest of the joint. Unless this is done there is danger of the pipes being out of line,

due to the contraction of the metal at the last point closed on the circumference of the pipe.

To insure a high character of workmanship the welders must be carefully watched and supervised. In cases where standard fittings or a graceful pipe bend would otherwise be employed, welding permits a solution, the very *ease* of which is its greatest danger. In other words, any odd angle or turn in the pipe can be made by a welder by simply burning the ends of the pipe to fit together in the form of a miter joint and then welding the two ends together. This is done in much the same manner that a joint or bend is made in any ordinary round stovepipe and looks about as bad. An example of this style of welding is shown in Fig. 90, and it will readily be seen that not only is the appearance unsightly and amateurish, but that the friction introduced into the line will be much greater than if a pipe bend or even an ordinary fitting had been used.

Special Problems in Welding Headers

Welded headers with nozzles also seem to be particularly open to careless workmanship, whereas, with the older style of work, the header would be made up with pipe and standard pipe fittings which have a predetermined dimension from center to face of the branch flange. No such consistency is customary with the welded header offered as a substitute. A header *can* be made to conform to exact requirements of fixed dimensions from the center of the header to the face of the nozzle flanges, but what usually happens is that the welder looks around the job and discovers a few odd short lengths of pipe of the right diameter and which have a thread on one end. He takes these random lengths and welds them into holes burned out of the header pipe. The results often are somewhat like the illustration in Fig. 91.

It is details like these which must be guarded against if criticism of welding work in general is not to be encountered and if a workmanlike job is desired. There is no reason why a welded job cannot be neatly made and have the same pleasing appearance as piping made up with the usual fittings and pipe bends. It requires a little care to do welding right, and a welder should understand a good welded joint is not a tight and strong joint, but also a neat appearing one.

From present indications it would seem that welding—if properly carried out—has a great field in the piping industry; on the contrary, if it is carelessly done, the impression will gain ground that a welded job is not only a *cheap* job but is also a sloppy one.

There are many other instances of welding in the heating plant of today; there is the electro-welded steel boiler, the oxy-acetylene welded steel boiler-flue, the electro-welded hot-water tank, and the welded blow-off tank. Doubtless as time goes on still other applications will be made.

The Question of Corrosion

The only point which seems a questionable one in a welded pipe, and which cannot be guarded against even with careful supervision, is that of corrosion. The welded joint has not had enough use for us to say positively that it will stand up under the trials of corrosion as long as the pipe on which it is used. There may be nothing yet developed which shows a failure from this cause, but it will be noted that every time a welded joint is rained on after being made it will show rust in much greater quantity than forms on the body of the pipe. The welding material is not exactly the same material as the steel-pipe body, and this being so it is doubtful if the resistance to corrosion will be identical. Of course, if the resistance is greater there is no fault to be found with the welded joint on this score, but if the resistance is less, it follows that the destructive corrosion of the joint will take place before the giving way of the pipe. This is a matter that only time will tell, and then not for several years and until authentic cases are reported where welded lines have failed at the joints while the shell of the pipe has remained comparatively sound. It is well known that the ordinary cast-iron fitting is more resistant to corrosion than the steel pipe and therefore no misgivings have ever occurred on this score. It would seem, however, that the welded joint has yet to demonstrate its ability in this direction, and, if it does, the welded job, carefully supervised, will be second to none for either appearance or durability.

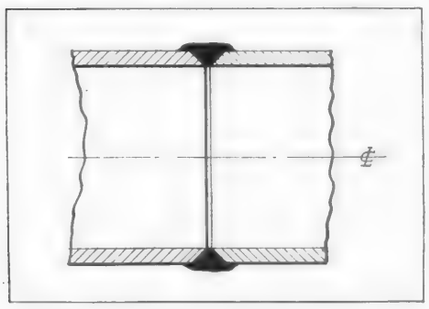


Fig. 89. Built-Up Weld

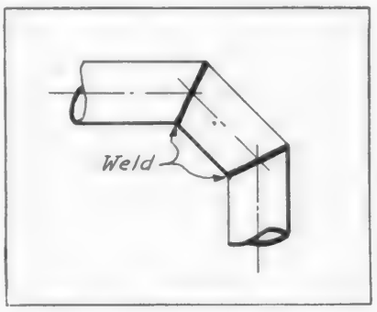


Fig. 90. Miter Weld

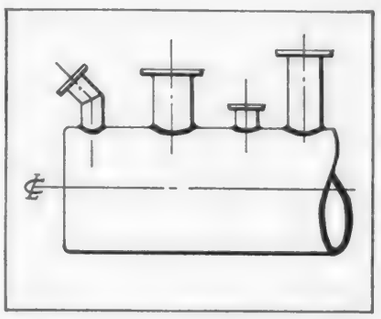


Fig. 91. Typical Welded Header

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DESPITE the trying year through which the domestic oil-burning industry has just passed, indications are increasing that the low point has been passed; that the trend again is upward and that this industry will progress on a stable basis.

Among the explanations advanced for the hesitancy in the industry, three are worthy of notice. One manufacturer, for instance, attributes the lag to the fact that the announcement of lower-priced burners, made by a number of manufacturers, led the consumer to believe there would be reductions in the higher-priced models and he has been waiting to get the benefit of such a trend.

Another explanation, which seems more logical, is that 1926 business was somewhat analogous to what the petroleum industry knows as "flush production." The entire industry, according to this analysis, located and sold a lot of ripe prospects. When these were disposed of, the oil-burner business dropped in 1927, to what might be designated as "settled production."

Still another reason advanced is that the mushroom growth of a large number of local enterprises adversely affected the business of the nationally-known manufacturers, a condition which already is adjusting itself through the liquidation of many of these unstable companies.

Whatever may be the cause of the conditions which recently have prevailed in the oil-burner industry, it is reassuring to know that the factors here cited no longer are a determining influence. To-day, leaders in the industry sense a future development, less spectacular than the "boom" of 1926, but more profitable to manufacturer and dealer alike.

THROUGH an odd chain of circumstances, the announcement by the radiator manufacturers of new radiator ratings, published last month in these columns, almost coincided with a request on the part of the Committee on Research of the A. S. H. & V. E. that the radiator manufacturers publish the ratings of their product in B.T.U. and to certify and guarantee such ratings. In one sense the Research Committee's recommendation comes almost as an anti-climax because the manufacturers can now state that they are doing substantially that thing, and that for the time being, at least, the incident is closed.

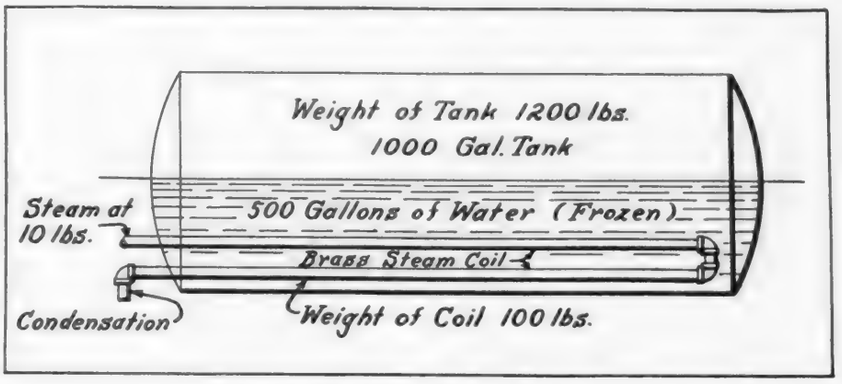
As a matter of fact, it is no secret that the recent revision of radiator ratings was not so much an engineering as an economic necessity caused by the spectacular drop, the first of the year, in radiator prices. Heating engineers and contractors, too, would be delighted to see radiators rated on purely a B.T.U. basis, and the prediction is made that eventually such a step is sure to be taken by the manufacturers. Even so, we must not expect too much from such a system of rating, for it will still remain within the discretion of the man who does the estimating to exercise his judgment in interpreting any given set of B.T.U. ratings.

SINCE announcing a new series of articles dealing in a general way with fundamentals, the idea has developed to the point where it seems feasible to establish a department which will be known as "The B.T.U. Club" for the interchange of opinions and information on a variety of topics connected with heating and ventilation. While the department is starting off in rather a formal way with a set article, its future make-up will depend entirely on what our readers make of it. We hope it will prove the medium for presenting informal discussions on matters of general interest but which seldom get into print. Take, for instance, any gathering of men interested in the practice of heating and ventilation. How few, after all, participate in the formal discussions, and how many valuable remarks are dropped *sotto voce* and lost because the speaker feels a diffidence in addressing the meeting. Our new department will be designed especially to offer such readers the opportunity for expressing themselves without feeling that their remarks will be subjected to that close scrutiny usually given the printed word.

How Would You Do It?

Question 7

A closed steel tank of 1000-gal. capacity stands in a temperature of 20° F. A steam coil of brass pipe is in the bottom to heat the water. The tank was half full of water and the water has frozen and cooled to the temperature of the air. Assuming that the weight of the coil is 100 lbs., and that the weight of the tank is 1200 lbs., how much steam must be condensed up to the time the water begins to boil if steam at 10 lbs. gauge is supplied to the heating coil? Neglect any heat loss during the heating-up process, and assume that the air temperature remains at 20° F.



Problem Presented in Question 7

THIS little problem will be found to be simple if the various steps are taken, one at a time, separate calculations being made for each. The heat necessary to bring the water to the boiling point will be the sum of the following items: The heat necessary to warm the ice up to 32° F., at which temperature it begins to melt; the latent heat that must be supplied to turn the ice from a solid at 32° F. into liquid at the same temperature, and the heat that must be added to raise the liquid to the boiling point. Besides there are some other factors to be considered later.

If there is 5000 gal. of water that has been turned into ice at 20° F., we first will convert this to pounds. (500 x 8 1/3 lbs. = 4167 lbs.) To raise this quantity of ice at 20° F. to ice at 32° F. will require a certain amount of heat, and the temperature range will be

$$32° - 20° = 12° \text{ F.}$$

If we were considering water instead of ice it only would be necessary to multiply the number of pounds by the temperature rise, since 1 B.T.U. will raise 1 lb. of water 1° F. But with ice the specific heat is only half that of water.

So, having 4167 lbs. of ice and a temperature rise of 12° F., the number of B.T.U. will be

4167 x 12 x 0.50 B.T.U. = 25,002 B.T.U.

or, in round numbers, 25,000 B.T.U.

To melt this weight of ice to water at 32° F. it is necessary to supply the latent heat required in the process of liquefying, which is 142 B.T.U. per lb. Then

4167 x 142 B.T.U. = 591,714 B.T.U.

As the (sensible) heat required to raise 1 lb. of water from 32° F. to 212° F. is 180 B.T.U., if there is 4167 lbs. of water, the heat required to raise the water to 212° F. is

4167 x 180 B.T.U. = 750,060 B.T.U.

Now it is possible to ascertain the total quantity of heat required to melt the ice and bring the resulting water to the boiling point. This is:

To warm ice from 20° F. to 32° F.	25,000 B.T.U.
To melt ice at 32° F.	591,714 B.T.U.
To heat water to 212° F.	750,060 B.T.U.
Total	1,366,774 B.T.U.

But, unfortunately, when the steam was turned into the coil it had to warm the coil, and as the contents of the tank rose in temperature, the metal of the tank had to be raised through the same temperature difference. The weight of the brass is 100 lbs. and it must be raised from 20° F. to some temperature lying between that of the steam supplied to the coil and the maximum temperature of the water outside of the coil. It might be argued that the coil would approach very close to the steam temperature, or that the coil temperature would be nearer that of the water. It should be fair to assume that the coil ultimately has a temperature exactly half way between the steam temperature and the maximum water temperature.

As the steam is being supplied at 10 lbs. pressure the temperature of the steam will be 239° F., and the maximum temperature of the water is 212° F. The brass of the coil must be raised to the mean of these temperatures, or 225.5° F. from 20° F., or a rise of 205.5° F. The specific heat of brass is 0.088, so that the heat required to raise the coil to 225.5° F. may be figured as though it were a similar weight of water and the result multiplied by 0.088 to reduce it to the proper amount of heat for brass.

100 lbs. x 205.5° x 0.088 B.T.U. = 1818 B.T.U.

Similar treatment would develop the amount of heat absorbed by the tank, if the steel in it reached the same temperature as did the heating coil. But the tank is setting in air at 20° F. temperature, so that the average temperature of the steel shell may be assumed as being midway between the maximum water temperature and the outside air temperature. This is:

$$\frac{212° - 20°}{2} = 96° \text{ F.}$$

Therefore the tank steel must be raised from 20° F. to 96° F., or a rise of 76° F., and the heat required will be

1200 x 76 x 0.117 B.T.U. = 10,670 B.T.U.

The total of all the heat to be supplied may be summarized as follows:

PURPOSE	B.T.U.
Warm ice to 32° F.	25,000
Melt ice to water	591,714
Heat water to 212° F.	750,060
Heat brass in coil	1,808
Heat steel in tank	10,670
Total	1,379,252

It now is necessary to see how much can be absorbed from 1 lb. of steam at 10 lbs. gauge pressure. Reference to standard steam tables shows that, at 10 lbs. gauge pressure, the units given off per pound of steam condensed (latent heat) are 951 B.T.U., and the temperature of the steam and of its condensate before it begins to cool is 239° F. If an average temperature of condensate discharged from the coil is assumed to be 200° F., there will be a certain amount of heat given up by the condensate before leaving the coil.

Now, if the condensate temperature falls from 239° F. to 200° F., the drop

is 39° F. and the amount of heat given up will be the difference between the heat units at the two temperatures, or

$$207 - 168 = 39 \text{ B.T.U.}$$

per pound of condensate so lowered. Therefore each pound of steam condensed will give up its latent heat, or 951 B.T.U., plus the heat lost by the condensate in dropping to 200° F., or 39 B.T.U., making a total heat delivery of

$$951 + 39 = 990 \text{ B.T.U.}$$

As it has been computed that the total heat required is 1,379,252 B.T.U., it only remains to divide this quantity by the heat absorbed from each pound of steam, or

$$\frac{1{,}379{,}252}{990} = 1{,}392.2 \text{ lbs.}$$

PROBLEM FOR NEXT MONTH

Question No. 8

In a heating installation involving 50,000 *sq. ft. of equivalent direct radiation the steam will be supplied from a high-pressure,* 100-*lb. boiler. The heating engineer recommends an* 8-*in. header,* 30 *ft. long, in the boiler room, from which steam will be taken through reducing valves to supply the heating system. The architect thinks a* 12-*in. header of the same length advisable, due to the additional storage capacity of high-pressure steam which would be held in reserve in the header to take care of any sudden demands. Is there any advantage to be gained by using the* 12-*in. header, and what additional heat storage capacity would be gained? Assuming a drop from* 100 *lbs. gauge down to* 70 *lbs. gauge in the header, how long would the extra steam capacity, obtained by using a* 12-*in. instead of* 8-*in. header, supply the radiation in the building?*

Southern California Heating and Ventilating Council Organized

Southern California Heating and Ventilating Council, recently formed in Los Angeles, Calif., has announced as its purpose to operate directly upon the heating and ventilating trade in the standardization of materials and methods, and to promote legislation to help the industry.

Membership will consist of active and associate members. Active members will be members of the Heating and Piping Contractors' Association and the Los Angeles Society of Heating and Ventilating Engineers. Associate members will not have a voting power in the meetings and will consist of engineers connected with public works and utilities, and engineers employed by private contracting firms and individuals. Regular monthly meetings will be held on the first Wednesday of the month.

National Trade Extension Bureau Becomes Plumbing and Heating Industries' Bureau

In accordance with the new constitution adopted at a meeting of the directors of the National Trade Extension Bureau, held in Evansville, January 27, this organization becomes officially known as the Plumbing and Heating Industries' Bureau. The new designation was adopted to better describe the functions of the organization, particularly in regard to a national advertising campaign for which a budget of $120,000 was approved. The directors also approved the work of the program and budget committees, the publicity and sales promotion and other committees; decided to retain its headquarters at Evansville; authorized the opening of a western office at San Francisco, and approved a plan to conduct a test campaign in co-operation with the Philadelphia Plumbing and Heating Development League and the starting of a national advertising campaign. Officers were elected as follows: President, Thomas F. Nolan; vice-president, A. M. Maddock; honorary vice-president, William J. Wooley; treasurer, A. B. Pierce, and secretary, William C. Bergner. A new office of general manager was created and Russell G. Crevis-ton was elected to that office.

The following were elected to the board of directors: Charles K. Foster, American Radiator Co., Chicago; J. W. Oliver, Standard Sanitary Mfg. Co., Pittsburgh; W. K. Glen, Crane Co., Chicago; Charles Nash, Standard Sanitary Mfg. Co., Pittsburgh; L. L. Smith, Kohler Co., Wis., and Martin Weil, Weil-McLain Co., Chicago.

Approximately $70,000 will be expended to carry out a market develoment plan that has been prepared as a test for use in Philadelphia. A successful conclusion probably will involve extension of the plan to other important cities. A national advertising campaign will center around full pages in the Saturday Evening Post, beginning April 28, in a carefully prepared series of advertisements, which will appear periodically. The bureau's field force will materially be increased to include a field woman for women's clubs and civic group contact, heating experts and additional staff members to call on the heating and plumbing trade and to assist in the development of business. The budget of $350,000 is substantially double the annual expenditures for any previous year and represents the backing of over 800 manufacturers and wholesalers, the Heating and Piping Contractors National Association, the National Association of Master Plumbers and other allied interests.

New York University Conducts Short-Term Course in Plumbing and Heating

Water supply of buildings, chemistry in the plumbing industry, sprinkler systems, welding, refrigeration by gas, oil burning and house heating by gas, were among the subjects given a prominent place in the short term course in technical instruction conducted at New York University, January 23-25, for the benefit of members of the New York State Association of Master Plumbers. Over 200 contractors registered for the course.

Dean Connelley and Prof. S. E. Dibble. of the Carnegie Institute of Technology, were in attendance at the opening session, which was held in the Gould Memorial Library Auditorium. Associate Dean Bliss was chairman of the meeting. Others on the platform were: Chancellor Brown, Dean Snow, and Judge John E. McGeehan, district attorney of Bronx County.

The subject of sprinkler systems, standpipes, and other fire-fighting equipment was presented by Arthur Cary Hudson, principal assistant engineer in the Fire Prevention Department, National Board of Fire Underwriters.

R. B. Aitchison, service supervisor, The Linde Air Products Company, presented a demonstration of cutting and welding, both steel and cast-iron pipe and fittings. This included the welding of steel piping for a residence installation.

Refrigeration by gas was discussed by A. Rathemacher, service engineer for the Consolidated Gas Company, New York.

The oil-burning conference was conducted by Leod D. Becker, managing director of the American Oil Burner Association.

A. M. Apmann, chairman of the A. G. A. sub-committee on house heating specifications, had charge of the conference and demonstration on house heating by gas and large-volume water heating.

Others who spoke were Cecil W. Farrar, president of the Excelso Products Corporation; Prof. Walter S. L. Cleverdon, who urged the establishment of a chair on plumbing, heating and ventilating, at New York University, similar to that at Carnegie Institute, and Frank J. Fee, who told of the inception and establishment of the scholarship at Carnegie Institute of Technology, and of the plans under way to include other universities.

Dean Connelley made the comment during the institute that he expected non-degree subjects eventually will be given a more prominent place in the colleges. He said that he looked forward to the time when heating contractors and master plumbers will be known as "engineers of plumbing, heating and ventilating."

Stephen H. Welch, chairman of the committee in charge of the institute, received many congratulations on the success of his efforts.

Legal Decisions

Excessive Damages

It sometimes happens that, in actions for damages for personal injuries, the plaintiff is awarded by the jury damages which appear to the defendant to be excessive and the latter then moves for a new trial. The trial court, if of opinion that the damages granted are excessive may require the plaintiff to remit some part of them as a condition of denying the defendant's motion. If the plaintiff agrees to this remittitur, judgment is then entered for the lesser sum. The defendant, however, may still think this sum too large and appeal to a higher court, or the plaintiff may, if the trial court cuts down the verdict appeal. Several appellate courts, which consider only questions of law and not questions of fact, such as the federal appellate courts, the New York Court of Appeals and the Supreme Courts of Illinois, New Hampshire, Oregon and South Carolina, refuse to interfere on the point of excessive damages, leaving this question entirely to the discretion of the trial court. If the appellate court is one which does consider this question, it may affirm the trial court's action, or reverse it and restore the jury's verdict, or it may insist upon a still further reduction by the plaintiff as an alternative to a new trial. This is what happened in the case of Mahmet v. American Radiator Co., Missouri Supreme Court, 294 S.W. 1014. In an action for injuries to the plaintiff's right hand, a verdict for $15,000 was returned by nine jurors. The trial judge indicated that defendant's motion for a new trial would be sustained unless the plaintiff remitted $5000. This the plaintiff did and judgment was entered for $10,000. The defendant appealed on several grounds, one of which was that the damages were still excessive. The Supreme Court considered the damages were still excessive by $2500, and gave the plaintiff the option of consenting to a reduction of the judgment to $7500, or of a reversal and a new trial.

Each case of excessive damages is, of course, decided on its own special set of facts, which cannot be entirely like that of any other case. But these decisions are often of interest and of use in showing what action the courts are likely to take in similar cases. The changes in the purchasing power of money should be taken into consideration in studying the decisions, and therefore, the more recent cases are likely to be the most helpful.

The circumstances of the present case were as follows: A metal boiler or radiator weighing about 700 lbs. fell on plaintiff's right hand, crushing three of the metacarpal bones, compounding them into the palm. The hand became infected, the injury finally resulting in considerable palm scar tissue and contraction of the tendons, so that from the time of the injury until the date of the trial, a period of about a year and a half, plaintiff was unable to work at all and his hand and fingers were left so crooked, drawn and contracted that he could not grip anything, or do any work with them. Immediately following the injury he was confined to a hospital for more than 40 days, then treated for a long time, and, according to the medical testimony, the hand was rendered practically useless and the condition was regarded as permanent. When injured the plaintiff was earning about $31 a week.

Sufficiency of Notice by Ventilating Contractor Before Action on Surety Bond

In an action in the Minnesota courts on a public contractor's bond, for ventilating fans furnished by the plaintiff to the contractors in the erection by them of a public school, the trial court found that the plaintiff failed to serve the notice required by the Minnesota statute in order to maintain the action, and directed judgment in favor of the bonding company. The Minnesota Supreme Court, Ilg Electric Ventilating Co. v. Conner, 215 N. W. 675, holds that the notice sent complied substantially with the requirements of the statute, Minn. Gen. Stat. 1923, Sec. 9705, which provides that no action shall be maintained on such a bond unless, within 90 days after acceptance of the building by the proper public authorities, the plaintiff shall serve on the principal and his sureties a written notice specifying the amount of his claim on the date of furnishing the last item thereof.

The notice which the plaintiff sent to the bonding company specified the nature of the claim and the amount, and was sent within 90 days after the acceptance of the building. It did not, however, state the date of furnishing the last item, and the question was whether this omission rendered the notice insufficient. The Supreme Court holds that the statute being a remedial one, only a substantial compliance with it was required, and the omission was not a substantial defect, considering that the date of the last item has no bearing upon the rights of the parties. The date determinative of rights and which sets the time running is the date of acceptance of the building for which the materials were furnished. The words in the statute requiring the date of furnishing the last item appeared to have been inadvertently retained from the section prior to its amendment in 1909, since they were meaningless in the present statute.

Authorized Change in Heater Installation Contract

A contract for plumbing and heating apparatus to be furnished and installed in a residence according to specifications included a heater costing $171. The contract provided that the owner might select other fixtures and apparatus than those specified, in which event he would be credited with the values as specified and charged with the values as substituted, whether greater or less. A heater was put in costing over $200. On settlement dispute arose, the difference between the parties being the difference between the cost of the fixtures as specified and as actually installed. In an action for the balance claimed, the defendant testified that his building superintendent and his foreman had no authority to change any of his agreements with the plaintiff as to the materials to go into the building, and that he was not informed that a different heater from that specified was to be or had been installed. The plaintiff's evidence showed that defendant's superintendent gave him instructions to install the substituted heater. It was held that, since the defendant's foreman, having apparent authority to do so, had ordered the changes made and that a statement was rendered to the defendant after the completion of the job showing that additional charges considerably in excess of the original contract price were being made, to which the defendant did not then object, the defendant was estopped to deny that he had ordered a higher priced heater. Aldridge v. Tully Plumbing & Heating Co., Alabama Supreme Court, 114 So. 130.

Blue-Print Reading

A textbook designed to give students in industrial art work a knowledge of how to read blueprints is announced by the Bruce Publishing Co., Milwaukee, Wis. It was prepared by Thomas A. Diamond, associate professor of vocational education at the University of Michigan. The first of the two sections into which the primer is divided provides a series of mechanical drawings that the student is asked to interpret by answering questions concerning dimensions, construction, relations, etc., of the object shown. The drawings illustrate the common conventions of drafting through progressive steps from simple to complicated forms. The second part applies the principles learned in the first section in a series of dimensioned perspective sketches and in complete projection drawings which the student completes by supplying missing views or dimensions. This is an excellent handbook for the young engineer. Size 6 in. x 9 in. Pp. 72. Price 48 cents.

The Heating and Ventilating Magazine's B.T.U. Club

EVERY reader of THE HEATING AND VENTILATING MAGAZINE, *whether a subscriber or not, is a member of this club. There are no initiation fees or dues. There is not even a constitution. The club will function as a forum or round table for the informal discussion by our readers, particularly the younger men in the industry, of topics in which they are interested, provided only that such topics pertain directly or indirectly to heating and ventilation.*

Those who fear "to rush into print" will find here an opportunity to unbosom themselves in the privacy of the club, as it were. Do not get the impression that your question or comment is too trivial for publication, so long as it interests you. No doubt it will interest others as well and we will all be benefited by talking it over.

So, what's on your mind? Send it in marked "B.T.U. Club" and let's discuss it here just among ourselves.

The B.T.U.—What It Is and How to Use It

CERTAIN natural laws affect the action of all heating and ventilating equipment. They are as immutable and unchanging as the Rock of Gibraltar and even more dependable, for conceivably the Rock could be destroyed or sunk underneath the sea by some cataclysmic disturbance, but the amount of heat passing through a wall of given thickness and construction under known conditions of temperature, humidity and air movement will not alter. A knowledge of the fundamentals involved helps immensely toward an understanding of the more or less complicated mechanical applications encountered in heating and ventilating work.

WITH the increasing diversity of heating and ventilating apparatus and devices, the growing number of schemes and methods of heating, and the tearing down of old theories and standards without the furnishing of newer and better ones, it is necessary at times to hark back to basic principles.

No matter how complicated a piece of apparatus may be, its principle of operation may be grasped more readily if there is a thorough understanding of the A-B-C of heating and ventilating.

Moreover, the expansion of the industry during the last few years has resulted in hundreds of additions to the ranks of those interested in heating and ventilation. These newcomers, in some cases, have scant knowledge of the business into which they have been projected and are seeking everywhere for the why and wherefor of this and that. To such newcomers, as well as to the rising generation, this article is especially directed.

THE B.T.U.

To everyone in the heating and ventilating field the term "B.T.U." is a most familiar one. It stands, of course, for British thermal unit and is the standard and recognized abbreviation for this rather cumbersome designation; while there has been considerable agitation from time to time to have this shortened to "heat unit" or something even briefer, the old abbreviation still holds its own against all comers.

Just what is a B.T.U.? It cannot be counted except by measuring its *effect* on something. It is in reality only a measurement of heat and an arbitrary measure at that. For simplicity it may be defined as the quantity of heat required to raise the temperature of a pound of water one degree. The pound of water is the common avoirdupois pound and the degree is the common Fahrenheit degree. But water does not take exactly the same amount of heat to raise it one degree at all temperatures; so, to be strictly accurate, a certain temperature of water is settled upon as a basis in determining a B.T.U. Thus, from an academic standpoint a B.T.U. is the amount of heat required to raise 1 lb. of water from 63° to 64° F. and may be defined as follows:

Definition 1. *A B.T.U. equals the amount of heat required to raise* 1 *lb.* (*avoirdupois*) *of water* 1° *F.*

While the B.T.U. represents the American and British method of measuring heat, other countries have adopted the *Calorie*, which may be defined as:

Definition 2. *A Calorie equals* 3,968 *B.T.U.*

and conversely

Definition 3. *A B.T.U. equals* 0.252 *calories.*

The variation in the amount of heat required to raise the temperature of 1 lb. of water 1° from different initial temperatures is so small as to be practically negligible, as is shown in Fig. 1. For this reason the B.T.U., in nearly all calculations, is considered as being the amount of heat necessary to raise 1 lb. of water 1° F.

In Fig. 1 the chart is laid out with the temperatures of the water across the top and subdivisions of a B.T.U. in hundredths on the scale at the left. It will be noted that while 1 lb. of water requires a little more than 1 B.T.U. to heat it 1° at 32° F., it requires just 1 B.T.U. at 63°, less than 1 B.T.U. at 90°, just 1 B.T.U. again at 160° and slightly more than 1 B.T.U. at 200°.

ALL HEAT CALCULATIONS BASED ON THE B.T.U.

Now all heat calculations are based on the B.T.U. and if it is remembered that a B.T.U. represents only a certain quantity of heat many difficulties will disappear. For instance, if the quantity of heat developed when a pound of coal is burned is all transmitted into a certain amount of water, then the temperature of the water will be raised a certain number of degrees. By dividing the amount of heat generated by the coal by the amount of heat required to raise the water 1° F. it may be ascertained how many degrees the water will be raised.

Thus, theoretically, if 2 lbs. of coal (containing 14,000 B.T.U. per pound) were completely consumed there would be liberated 14,000 B.T.U. x 2, or 28,000 B.T.U.

Let us assume that this amount of heat is all transmitted to a quantity of water amounting to, say, 1000 gal. At 8 1/3 lbs. per gallon the weight of the water would be 8333 lbs.

It would take 8333 B.T.U. to raise this quantity of water one degree since 8333 lbs. × 1 B.T.U. = 8333 B.T.U. But there are, theoretically, 28,000 B.T.U. available, so 28,000 B.T.U./8333 B.T.U. = 3½° approximately.

Of course, in practical work all the heat generated in combustion cannot pass into any one receiving medium, for part of the heat goes up the chimney, and is lost altogether; part is radiated from the apparatus in which the coal is burned, and part of it warms the cold air being supplied to maintain combustion. Also some of the coal may not be fully consumed, and so on.

Heat losses from a room and from a building are calculated in B.T.U., and the heat emission from the radiators may be expressed in B.T.U. If the losses for a definite period, say, one hour, are divided by the heat emission during the same period the number of square feet of radiation may readily be determined.

Similarly a pound of steam condensing in a radiator will liberate a certain number of B.T.U. and the total heat emission of all radiators, divided by the number of B.T.U. given up per pound of steam condensed, will show how many pounds of steam will be required.

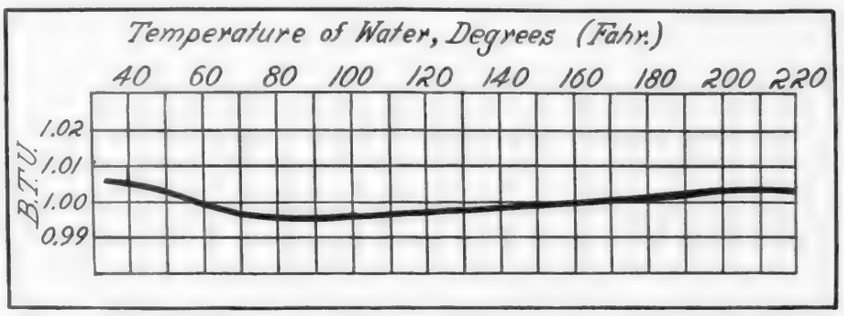


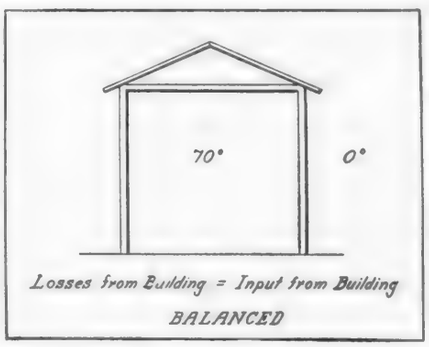
Fig. 1. Heat Required to Raise the Temperature of 1 Lb. of Water One Degree with Different Initial Temperatures

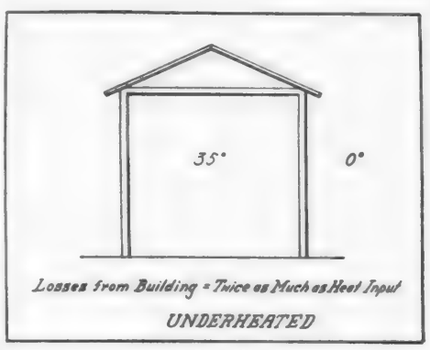
HEATING CALCULATIONS

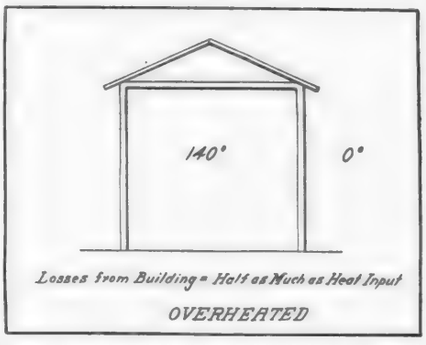
All heating is a balancing of the heat input against the heat losses. When these two amounts are equal a state of heat equilibrium is obtained and a given temperature can be maintained in the building. If the heat input is less than the losses then the inside temperature is bound to fall and the building will be "underheated." The inside temperature will continue to drop until the heat input at the reduced temperature just equals the heat losses. On the other hand, if the heat input exceeds the heat losses the temperature is just as sure to rise and "overheating" results.

In Fig. 2 is shown diagramatically a building in which it is desired to maintain an inside temperature of 70° when the outside temperature is zero. If the input of heat into the building is exactly equal to the heat losses at zero outside temperature, then 70° will be produced and maintained as shown. Should the input be only half the losses, as illustrated in Fig. 3, then the inside temperature will fall to 35° where the heat balance will again be established. In Fig. 4 is shown a case where the heat input is twice the building losses at 70°, in which case the building temperature will rise to 140°, where a new heat balance will be established.

Assume that a building is figured for an inside temperature of 70° F. with an outside temperature of zero. When the outside temperature rises to 35°, the heat losses will be only half as much as at zero and the input of heat must be reduced accordingly. When we consider that the average winter temperature in localities experiencing zero as a minimum is around 35° F., it will be seen that the average heating system is functioning most of the time under only about half of its maximum load.







Figs. 2, 3 and 4. Diagrams of Building Showing Various Conditions of Heating

The B.T.U. has many equivalents in various other forms of energy, for heat itself is a form of energy—or is believed to be. Consequently, it has its equivalent in electric current, work as expressed in foot pounds, and so on. The equivalent in calories has already been given but this is a different kind of equivalent, being simply another method of expressing the amount of heat.

1 B.T.U. equals:
- 778 foot-pounds
- 0.000293 kilowatt-hours
- 0.000393 horsepower-hours
- 0.001036 pounds of water evaporated from and at 212° F.

Foot-pounds represent a measure of work, kilowatt-hours a measure of electrical energy, horsepower-hours a measure of mechanical energy, and pounds of water evaporated are based on the "latent" heat in a pound of water. It is sometimes more convenient to have the figures the other way round so that decimals of five or six places will not have to be handled. Outside of the foot-pound equivalent, which is a whole number, the above equivalents may be similarly expressed as follows:

- 1 foot-pound equals 0.001285 B. T. U.
- 1 kilowatt-hour equals 3412 B.T.U.
- 1 horsepower-hour equals 2545 B.T.U.
- 1 pound of water evaporated from and at 212° F. equals 965.7 B.T.U.

The equivalents in either list may be used according to which may best suit the case or the ease of calculation.

LATENT HEAT

It will be well at this time to say a few words about latent heat, which has already been referred to but not defined. Latent heat, as distinguished from "sensible" heat, is the amount of heat absorbed or given off when a substance changes its form from a solid to a liquid or from a liquid to a gas, or vice versa. While this may not be strictly an orthodox definition, it is a brief one and conveys the general idea.

For example, ice is a solid and is a form of water. Now when this solid changes to water a certain amount of heat is absorbed to permit this change and this heat must be added to the melting ice, or the melting process does not proceed. Similarly, when water turns to ice a certain amount of heat is given

up and this amount of heat is exactly equal to the amount absorbed in melting the ice. The amount of latent heat per pound of ice is 142 B.T.U., so if a pound of ice at 32° F. is melted into water, also at 32° F., 142 B.T.U. must be supplied from some source.

A similar manifestation of latent heat is to be noted when water is evaporated into steam, only in this case the amount of latent heat per pound is 965.7 B.T.U., which means that when a pound of water is turned into steam 965.7 B.T.U. must be supplied to complete the process.

When steam at atmospheric pressure and 212° F. temperature is condensed back into water it gives up exactly the same amount of latent heat as was absorbed in the vaporizing process and this is the basis of all steam heating. The water is vaporized in a boiler and is condensed back into water in the radiator, giving out its latent heat to warm the radiator and, ultimately, the air in the room.

SPECIFIC HEAT

Still a third heat term must be understood and that is "specific" heat. While not as frequently encountered as the other two terms, at times it is quite important. Specific heat may be said to be only a comparison. It is, in fact, the proportional quantity of heat required to raise a substance through a given temperature rise when compared to the quantity of heat required to raise an equal weight of water through the same temperature rise. Thus, if it takes one B.T.U. to raise one pound of water one degree, and it takes only ¼ of a B.T.U. to raise a pound of air 1°, the specific heat of air is ¼, which, expressed as a decimal, is 0.25 (really 0.2375). Therefore, it may be seen that specific heat is the ratio of the number of B.T.U. required to raise a pound of any substance 1° F. divided by the number of B.T.U. required to raise a pound of water 1° F. (which is 1 B.T.U.). Water is always taken as the basis for comparison.

Specific Heat

Water	1.00
Ice	0.504
Air	0.2375
Brickwork	0.195
Masonry	0.2159
Cast-Iron	0.1189

Natural Gas Convention in Dallas

The Natural Gas Department of the American Gas Association will meet in convention at Dallas, Texas, May 7-10. This is expected to be the largest and most important natural-gas meeting yet held, and H. L. Montgomery of Bartlesville, Okla., chairman of the exhibit committee, reports that the largest exhibit of gas equipment and appliances ever staged by the natural-gas interests will be provided. Dallas is in the heart of the natural gas development in the southwest, and is a logical meeting place for this group.

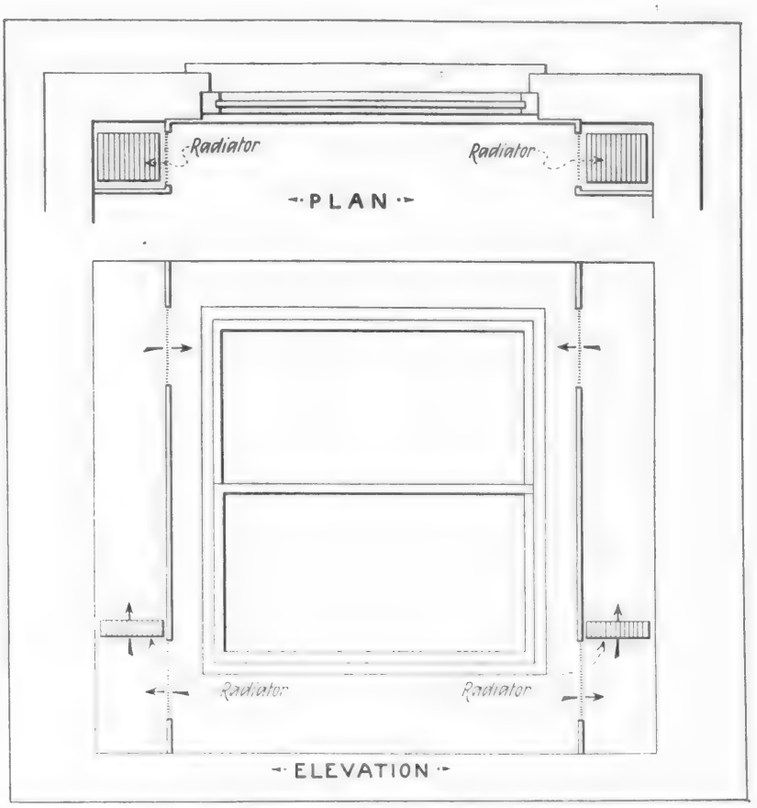
Test Data on Concealed Radiation

SOME idea of the effectiveness of concealed radiation is shown by a test made by John D. Small, consulting engineer of Chicago, of a brass radiator installation in a dining room of an apartment building at 2430 Lakeview Avenue, Chicago. It was planned to install 88 sq. ft. of cast-iron indirect radiation in this room and the concealed radiation was adopted on account of space limitations.

The room in question is on the ninth floor of the building and the radiation is located as shown in the accompanying sketch, one unit being placed on the north side of the window and the other on the south. The type of radiation used was the Thermodine. The sections are each located 36 in. above the floor. Directly underneath each section there is a grille 9 in. wide x 24 in. long, so that the bottom of the lower grille is 1 ft. from the floor. Mr. Small found that there was an effective stack height of 48 in. from the top of each section to the bottom of the upper grille. The upper grille in each case measures 9 in. wide x 24 in. high. As installed, it was figured that the two sections would correspond to between 30 sq. ft. and 35 sq. ft. of equivalent direct radiation. The installation was made by Mehring & Hanson, Chicago.

At the time of the test, the doors were closed and three thermometers placed at different levels in the center of the room, one about ½ in. from the floor, one at the 5-ft. level and the third 1 ft. from the ceiling. At the time of placing these thermometers there was no steam pressure in the boiler. The thermometer at the floor level registerd 70° F., the one at the 5-ft. level 72°, and the one at the ceiling 88°.

Anemometers gave readings at the top grille on the south side, indicating an air velocity of 100 ft. per minute. At a similar location on the north top grille the velocity was found to be 110 ft. per minute. Thermometer readings at the bottom and top grilles showed an intake temperature of 72° F. and an outlet temperature of 149° F. By opening the windows and doors the temperature of the room was brought down to 50°. At 2:30 P.M. the doors and windows were closed and at that time the temperatures at the three levels were: At the floor, 50° F.; at the 5-ft. level, 50°, and, at the ceiling, 80°. At 2:36 P.M. the thermometer read 60° at the floor, 60° at the 5-ft. level, and 90° at the ceiling. At 2:41 P.M., the corresponding temperatures were 64°, 67° and 91°. At 3:00 P.M. the thermometer at the floor level read 74°, at the 5-ft. level 76°, and at the ceiling 89°. During this period the outside temperature was 38°, while the steam pressure in the boiler was ½ lb.



Set-Up for Test of Non-Ferrous Concealed Radiation

Smoke Prevention in Relation to Health

By Peter H. Bryce, M. D.

IT is a far cry from the smoke testing tunnel, with its dense fumes, obstructing and dispersing the light, to clear mountain air, with its three parts of carbon dioxide in 10,000. Yet the difference is not great from that where the Christinaux Indians of the Qu'Appelle once lived in tepees, covered with deerskins, and having central fires of dry buffalo chips, giving off dense smoke, making their eyes bleary, and even blind from trachoma, though outside the dewdrops sparkled in the translucent air.

Indeed, men exist to-day, in every stage, from a scientific environment to that of savagery, and our present task is so to widen the conquests of science that our urban population, and the Indian, too, may live in an atmosphere approximating the pure air of the open prairies.

In order that we may do this, we have to understand something of what harm smoke does, of what it consists and of how it may be prevented. The following resolution was unanimously adopted at the recent meeting of the American Public Health Association, in Cincinnati, showing that public health officials are alive to the evil effects of smoke in our urban communities:

RESOLUTION

Smoke Nuisance

Whereas the advance of science and medical inventions has resulted in great improvement in the public health and great increase in social amenities, and

Whereas the rapid growth of urban populations and great industries has caused an enormous combustion of coal, the smoke from which may produce serious effects upon the health of city dwellers through intercepting the vitalizing rays of the sun and through the constant inhalation of smoke, as well as great financial expenditure through the cleaning required of clothing and house-furnishings; be it

Resolved, That the American Public Health Association, in convention assembled, desires to direct the attention of all legislatures and municipal authorities to the evils resulting from the "smoke nuisance," and to the need for passing and enforcing such laws as require the installation of smoke-consuming devices in industrial and other furnaces, and the adoption by railways of electric or oil engines or other means of suppressing the smoke nuisance caused by them within the limits of cities and towns.

FINER PARTICLES OF SOOT AND GASES CONSTANTLY IN SUSPENSION

Soot and gases from the combustion of coal constitute the major part of the smoke of towns, and, while the visible larger "blacks" slowly settle to the ground and into the houses, yet the air movements, due to wind and differing temperatures, keep millions of the finer particles constantly in suspension.

Sir Napier Shaw, dealing with the "Smoke Problem of Great Cities," illustrates this situation by stating that a cubic centimeter of air may contain, at one moment, as many carbon particles as there are pages in his book, and at another as many as there are words on all the pages put together. Thus, the atmosphere of great cities contains perhaps one millionth of its own weight in carbon and other particles. These added to the globules of water-vapor on a still day, create the fogs which so scatter and obtruct the sun's rays that noon may be transformed into midnight.

But besides the suspended carbon particles, there are the unconsumed hydrocarbon gases, as well as those of sulphur and other industrial fumes, which add to the nuisance of city smoke. It is obvious that where hundreds of thousands of tons of coal, especially soft coal, are burned, the problem of how to lessen or remove the infinite number of particles becomes the task of every physicist, mechanic and legislator.

We can imagine how the dry air of a prairie city, constantly kept in motion by the vagrant winds at twenty miles an hour, may do much scavenging of the city air, through carrying smoke particles far afield, and may indeed much improve combustion; but still the incomplete combustion of coal and its included volatile materials create a problem which is increasingly demanding a solution, as the serious effects of the loss of sunlight and the inhalations of air impurities are daily being better understood.

PROPER TEMPERATURE IN COMBUSTION OF CARBON FUELS

In a series of articles on the "Combustion of Oil Fuels," by P. E. Fansler, in THE HEATING AND VENTILATING MAGAZINE, the principles underlying the combustion of carbon fuels have been admirably illustrated, and we learn that the essential factor is the bringing together of the oxygen of the air and the carbon particles, whether solid, liquid or gas, at a temperature of 1100° to 1200° F. We are taught that the particles must be gasified in order that the oxygen may unite with the carbon. Thus, in the furnace, combustion demands that this temperature be attained before the fuel burns properly, and that complete combustion of the 25% of volatilized hydrocarbons given off in soft coal similarly must reach this point—either in the combustion chamber or later, at some point—as where the gases, given off from the reverberatory furnace used to burn garbage, are passed through a hot fire at the foot of the chimney stack, to compel combustion.

IMPORTANCE OF PREHEATING THE AIR

Obviously, preheating the air before it reaches the fuel, thereby preventing the chilling of the furnace, is an important factor in complete combustion. When we remember that every pound of air raised through 1° F. requires 0.25 B.T.U. and will absorb 25 B.T.U. in rising from 0° to 100° F., it is plain that unless provision has been made to prevent the cooling of the furnace walls smoke will be driven off owing to incomplete combustion. Further, the volatilized gases, so chilled, are not consumed, and though diluted through air drawn into the smoke stack, yet their particles have not been lessened in the outer air, even though their diffusion has been greater.

I recently investigated a very good smoke-consuming furnace in which an underfeed stoker is used, and the coal is carried automatically from the hopper and placed on the incandescent mass of coal. Its evaporating capacity with dry coal reaches 9 lbs. steam per pound of coal, but may drop to 7 lbs. with coal saturated in the dump with rain and snow.

Remarking to the engineer that I saw no smoke from his chimney, he said that that is the regular condition, and that should he be on the street and see any smoke issuing, he would know that his stoker had been pushing fresh coal forward while he was cleaning the grate bars. The explanation is easy, when we know that fresh coal will not burn until it has reached a temperature of 1200° F.; hence if 25 lbs. of fresh coal, having a specific heat of 0.25, is placed on the fire, some 7000 B.T.U. will be required to raise it to the combustion point. A further reduction of temperature is caused by the amount of heat rendered latent through volatilizing the gases contained in the coal. This reduction, of course, is still greater when wet coal is used, since the specific heat of water, being unity, four times the heat will be absorbed in changing water into a vapor.

EVIL EFFECTS AS SEEN BY CHICAGO CHAMBER OF COMMERCE

So obvious are the evil effects of smoke that it seems superfluous to recite them; but it is worth while to refer to the report of the Chicago Chamber of Commerce, which has summarized them. It states:

1. Sanitary authorities are agreed that polluted air is harmful to health; in addition to the direct effects there are indirect results, due to the diminution of sunlight and the menace in fogs, cloud and haze.

2. The injurious effects upon vegetation from tar and sulphurous products are obvious and well defined.

3. The injury to property, as buildings and goods, is especially due to the sulphur content of smoke.

A yet more definite estimate is the result of a Pittsburgh investigation as to the cost due to smoke. Summarized, a report of the Mellon Institute states that the loss to the inhabitants from smoke is $20 per head per annum, in wasted coal, laundry bills, injury to metal work, wall and cloth furnishings, cleaning and artificial lighting, or a total of over $10,000,000.

PRACTICAL ASPECTS OF THE PROBLEM

With such facts before us, we now may turn to the practical question of smoke abatement. In the Washington Bureau of Mines Bulletin 273, the problem is approached from the practical standpoint. Smoke there is divided into five grades of density: (1) where 20% of light is shut out and (5) where 100% is excluded. The city inspector is trained to observe from a tower and judges of the density by the eye, or still better, by a photograph.

As a rule, with the Ringelmann chart, the observations are noted every 15 seconds for a period of, say, one hour, and then are reduced to a standard for comparison. In this way not only are the worst offenders detected in *flagrante delictu*, but the relative value of different smoke consumers also is estimated. Certain industries, such as candy factories, are the worst offenders; while, in high-pressure power plants, it has been shown to be quite easy to reduce the smoke to a minimum density, or by 90%, without any economic hardship. Again, it is stated that while the smoke density from locomotives in rural districts may reach a density of 50%, this can be reduced with care in the city to 7%.

The regulations usually are made with a liberal allowance of elbow-room. For instance, five minutes of 100% smoke may be allowable while stoking the fire; but that this is often taken advantage of is obvious. The other day, for example, I stood within a hundred yards of the City Hall in Ottawa and saw at the same moment five different tall buildings belching out black smoke. An office table on the main street nearby will be distinctly black with soot within 24 hours and office curtains will become filthy within a few days.

Fortunately, in Ottawa, anthracite, formerly, and to-day coke and Welsh coal, with oil, are the chief domestic fuels, so that the smoke nuisance from domestic fires is but slight; but it is the use of bituminous coal in office buildings, in apartment houses, in factories and locomotives that creates a serious problem even in this northern city, not to any great degree coped with by the municipal enforcement of regulations.

HOW SOFT COAL MAY BE BURNED SMOKELESSLY

Remembering the principles of combustion already briefly outlined, we may now refer to some of the partial or complete solutions of the problem. Clearly to continue to tolerate the crude and artificial method of shovelling soft coal into a house furnace, on top of the fire, or that of a boiler, is to-day inexcusable, and may be expected to be permitted only in towns where municipal government is in its primary and undeveloped stage.

The Bureau of Mines bulletin referred to has illustrated by diagram the principles of proper stoking even in domestic furnaces; and in each case the first principle illustrated is a furnace in which, by hand or some mechanical stoking, a partial coking of the fuel takes place. This simply means that gradual heating of the fresh coal occurs at a point where its gases given off will pass over the incandescent mass of fuel, and the coked coal gradually will pass on to the fire grates. In some cities to-day this process has been developed so that the city gas company does the coking and then supplies domestic and other furnaces either with gas automatically supplied and regulated or with coke of various sizes.

Still greater advances are being made in the construction of furnaces, where from a reservoir or magazine, even pea-size or buckwheat coal of low cost automatically feeds on to single or double furnace grate-bars set at an angle so that the coking of the coal largely completes itself, while a slight top-draft supplies the requisite amount of oxygen, when the stoking brings down an extra amount of coal.

Obviously, the factor of an adequate supply of air for complete combustion in such a domestic furnace becomes of importance. Ordinarily, the furnace has to supply itself with air from the furnace room, which, in turn, comes through the cracks around the doors and windows.

NOVEL ARRANGEMENT FOR PREHEATING FURNACE AIR

The writer has found that simply by heating air in a 2-in. pipe, connected to a ¾-in. steam pipe for supplying humidity, some 20 cu. ft. per minute of outside air can be carried into the furnace room and adequately supplies the need of the furnace draft. The coal in such a furnace thus becomes like a brazier of charcoal, incandescent and with an absence of smoke.

SMOKE AS AN INDICATION OF WASTE

Apart from the evil effects of smoke, the measure of efficiency, with anthracite at $18 per ton, calls upon the engineer to provide, and the municipal authorities to insist on, the highest practical efficiency in coal combustion. Bulletin 40 of the Bureau of Mines gives a table showing percentages of efficiency after numerous tests with various devices from non-automatic to automatic, of from 62% to 66%, which is indeed a remarkable advance over that in a table by the English Fuel Research Board, thus:

	Efficiency Per Cent.
Ordinary open coal fire.....	24
Coke fires in grates.....	21
Coal fire in a register grate.	24
Low-temperature coke.....	31

Much is made of the pleasing sensations from an open coal fire, and one's memory goes back to "The Reveries of a Bachelor" in his old New England home, where he passes his Thanksgiving before a dry-maple wood fire, then one of cannel coal and, lastly, one of hard or soft coal, at a period when cost and service were nominal; but the modern electric bulb, hidden in colored glass coal lumps in the grate, supplies from the reflector both the radiant heat and the illusion.

TYPICAL RULES FOR SECURING SMOKE ABATEMENT

In a word, the remedies are known and it is only their application which the situation demands. While the local climate and industrial situation may vary, yet the English regulations clearly define the demands for remedial smoke regulation. These state that:

1. The Minister of Health should have power to compel any municipal authority to enforce smoke regulations.

2. The regulations should require every industrialist or householder to use the best practicable means for avoiding air pollution by smoke or other noxious emissions.

3. The Minister of Health should be empowered to fix standards from time to time and to appoint expert sanitary engineers to inspect and assist local authorities and manufacturers in dealing with difficult problems.

The law should impose larger fines than at present for violations of the smoke regulations. Obviously, such regulations are what most existing smoke by-laws in the United States and Canada aim at; but hitherto the assistance of State authorities in inspecting and advising has been lacking, the idea existing that if a town wished to live in smoke, it should be permitted to do so and so bring its own retribution. Larger ideas, however, of the State's duties and powers in maintaining health are gradually gaining ground and, it is hoped, will soon be fully developed.

NOTHING BUT THE TRUTH is the caption of a small folder issued by the Foxboro Co., Inc., Foxboro, Mass., featuring recording thermometers, pressure and vacuum gauges. The text in this folder emphasizes the simplicity in Foxboro design, and the illustrations substantiate the text.

AIR CONDITIONING
Calculations for a Typical Theater
(Continued from Data Sheet No. 20-O)

RESULTING TEMPERATURES AND HUMIDITIES

Assuming the air coming back from the auditorium is 80° F. and 54% relative humidity, then each cubic foot by-passed will contain 6.15 grains of water (allowing 0.40 grains for respiration), and if the apparatus is delivering air at 60° F., and saturated, this air will contain 5.75 grains per cubic foot. The mixture of 30,000 cu. ft. of air at 80° F. and 30,000 cu. ft. at 60° F. will produce 60,000 cu. ft. of air at 70° F. Similarly, the mixture of these two amounts of air with 6.15 grains per cu. ft. and 5.75 grains per cu. ft. will produce a resultant of 5.95 grains per cu. ft. which, at the temperature of 70° F. attained, is equal to 75% relative humidity.

MIXING FRESH AND RECIRCULATED AIR

When 75% of the air is recirculated and 25% of fresh air is added, a new combination results, as shown in Table 5.

In this table the quantities used are those assumed for the theater of 3000 capacity and the resultant temperature secured by mixing the combination of fresh air and recirculated air is taken as giving a temperature for the mixture of 80° F. Then three-quarters of this air is passed through the apparatus to cool it to 59° F. while the other quarter of the air is by-passed around the apparatus so that its temperature is unchanged. The mixture of these two quantities at the fan inlet will produce a temperature of 64¼° F., which temperature may be varied at will by changing, from time to time, the quantity of air being by-passed.

TABLE 5

75,000 C.F.M.	at 59° F.		(3)
25,000 C.F.M.	at 80° F.		(1)
100,000 C.F.M.	at 64¼° F.		(4)

$$59° + \left(\frac{80° - 59°}{4}\right) = 59° + 5.25° = 64¼° \text{ F.}$$

EXPOSURE FACTORS FOR H. & P. C. N. A. STANDARD RADIATION ESTIMATING TABLES (REVISED)

Data sheets for all cities in this list, except those marked with an asterisk, have appeared in previous issues of The Heating and Ventilating Magazine, and data sheets for the six cities so marked will be printed in succeeding issues.

	CITY	Base Temp.	POINTS OF COMPASS							
			N	NE	E	SE	S	SW	W	NW
*	Albany	+ 5°	1.10	1.10	1.05	1.0	1.0	1.0	1.10	1.10
*	Baltimore	+30°	1.40	1.40	1.30	1.0	1.30	1.30	1.40	1.40
	Birmingham	+30°	1.15	1.15	1.0	1.0	1.0	1.05	1.15	1.15
	Boston	+15°	1.30	1.10	1.0	1.0	1.0	1.30	1.30	1.30
	Buffalo	0°	1.0	1.0	1.0	1.0	1.25	1.40	1.40	1.40
	Chicago	+10°	1.25	1.0	1.0	1.0	1.15	1.35	1.35	1.35
	Cincinnati	+15°	1.10	1.0	1.0	1.0	1.35	1.35	1.35	1.20
	Cleveland	+ 5°	1.15	1.08	1.08	1.0	1.08	1.15	1.15	1.15
	Denver	+20°	1.30	1.30	1.20	1.25	1.25	1.25	1.0	1.30
	Detroit	0°	1.10	1.0	1.0	1.0	1.10	1.10	1.10	1.10
	Eastport, Me.	+10°	1.45	1.20	1.20	1.0	1.0	1.45	1.45	1.45
	Kansas City, Mo.	+15°	1.45	1.35	1.0	1.0	1.10	1.10	1.45	1.45
	Los Angeles	+50°	1.50	1.50	1.50	1.0	1.0	1.0	1.50	1.50
	Madison, Wis.	+ 5°	1.25	1.15	1.10	1.0	1.10	1.25	1.25	1.25
	Memphis, Tenn.	+30°	1.40	1.20	1.10	1.0	1.30	1.30	1.40	1.40
*	Milwaukee	+10°	1.25	1.0	1.0	1.0	1.15	1.35	1.35	1.35
	New Orleans	+45°	1.50	1.40	1.25	1.0	1.0	1.0	1.50	1.50
	New York	+10°	1.50	1.25	1.0	1.0	1.0	1.33	1.50	1.50
*	Norfolk	+30°	1.50	1.30	1.20	1.0	1.0	1.20	1.50	1.50
	Philadelphia	+15°	1.20	1.10	1.10	1.0	1.0	1.0	1.20	1.20
	Pittsburgh	+15°	1.30	1.0	1.0	1.0	1.30	1.35	1.35	1.35
	Portland, Ore.	+25°	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Providence, R. I.	+15°	1.50	1.25	1.0	1.0	1.10	1.25	1.50	1.50
*	Richmond, Va.	+30°	1.35	1.25	1.25	1.0	1.30	1.30	1.35	1.35
	Salt Lake City	+25°	1.10	1.0	1.10	1.10	1.10	1.0	1.10	1.10
	San Antonio, Tex.	+45°	1.70	1.70	1.40	1.0	1.0	1.0	1.70	1.70
	San Francisco	+45°	1.20	1.20	1.20	1.0	1.0	1.0	1.0	1.15
	St. Louis	+20°	1.30	1.20	1.0	1.20	1.20	1.20	1.30	1.30
	St. Paul	— 5°	1.20	1.0	1.0	1.0	1.0	1.10	1.20	1.20
*	Syracuse	0°	1.10	1.0	1.0	1.0	1.05	1.10	1.10	1.10
	Washington	+20°	1.20	1.0	1.0	1.0	1.0	1.0	1.20	1.20

For Denver, base temperature and exposure factors are based on actual Weather Bureau records but, due to rapid changes and high altitude, square feet of radiation in Standard Radiation Estimating Tables are figured on 200 B.T.U. emission instead of 225 B.T.U.

Correspondence

Conducted by T. W. Reynolds

Equalizing Boilers of Two Different Makes

EDITOR HEATING AND VENTILATING MAGAZINE:

A job hooked up as shown in the accompanying sketch (Fig. 1) has been a bone of contention among the trade in a certain small town for some time. Nearly everyone had a try at making the water-line of the two boilers equalize. The fireman cannot leave the place at all and has to juggle the gate valves as the fires vary.

I suggested the removal of the flaps from the check valves and the installation of one check valve in the return outside of the cross connection merely as a trial method, because it is problematical whether two different makes of boilers of this type could be equalized. One of these boilers doubtless sets up greater pressure in the fire-box section than the other boiler, due to more restricted outlets into the steam space. A point to be considered is that the water leaves the other boiler even when it does not have the hottest fire.

Saginaw, Mich. I. N. E.

The opinions expressed by the correspondent doubtless are true, to a certain extent, where two different makes of boilers are interconnected, but where such boilers are truly equalized no great difference in water-line should result. Ordinarily, where two boilers are not properly equalized, water will lower in the boiler having the higher pressure and rise in the other, but in the case cited the reverse is true.

This reverse condition could take place to a slight extent, no matter how good the method of equalization that might be used because the boiler having the hottest fire is steaming faster, which causes the water in this boiler to rise slightly higher than the water in the adjacent boiler, due to the steam bubbles in the water. As the water in the latter boiler is in a more condensed form it stands at a lower level.

DIFFICULTIES IN EQUALIZATION WHEN CHECK VALVES ARE USED

Where one check valve offers more resistance than the other, and they frequently do, the greater flow of water will be to the boiler which is connected to the check offering least resistance. Though the correspondent's idea of only one check on the main return would overcome such a difficulty, it would have the disadvantage of allowing the interchange of water between the two boilers, when evaporating at different rates or pressures, and would further be liable to cause cracked sections, especially should the steam supply valve of one boiler be closed and the corresponding valve on the branch return left open.

There should be very little trouble, if any, where the so-called Underwriters', or safety, loop is installed, as shown in Fig. 2. Such an arrangement gives true equalization above the water-line on both steam and return side of the boiler water-line. Water cannot leave either boiler at a lower elevation than the inside of the bottom of the topmost pipe forming the safety loop, as otherwise might occur, should the pressure vary or should the return valve be left open when the supply valve is closed.

This method or safety loop removes the resistance of the checks, as well as the inequality of their resistance. It is a check valve in itself which not only accomplishes the purpose in mind to better advantage without the use of check valves, but has also the advantage that should a supply valve be closed while pressure is on the boiler, the boiler would still be connected to the system so as to relieve the pressure through the return header. Another feature is that under such conditions attention would no doubt be directed to the boiler because of the resulting water hammer as produced in the return piping. It is for these reasons that the safety loop is favored by the Underwriters.

Check valves add considerably to the friction, a difference in pressure being required each side of a check valve of at least 1¾ oz. before the flapper of the valve will swing open. This will cause the water to stand 3 in. higher in the returns and add that much to the water held back from the boiler while increasing the required vertical distance of main above boiler waterline. When the system is first heating up from cold the pressure differential is greatest, so that it is advisable to return all water as soon as possible to the boiler. It is for this reason that only check valves having vertical hanging seats should be used, instead of those with seats at 45 deg.

As the check valves deteriorate in service, even more than a 3-in. head of water is often required to lift the seat. Again check valves of the water type are sometimes used in error, in which case troubles ensue due to the fact that the rubber disc on the flapper, at the point where it seats, swells up when hot condensation comes along. Gate valves should always be on the boiler side of the check to allow repair of the check valve.

In Fig. 1 the only way for the steam pressures of the two boilers to equalize is by way of the steam header and equalization might take place if the header is very large, but it cannot be depended upon. It is quite difficult to

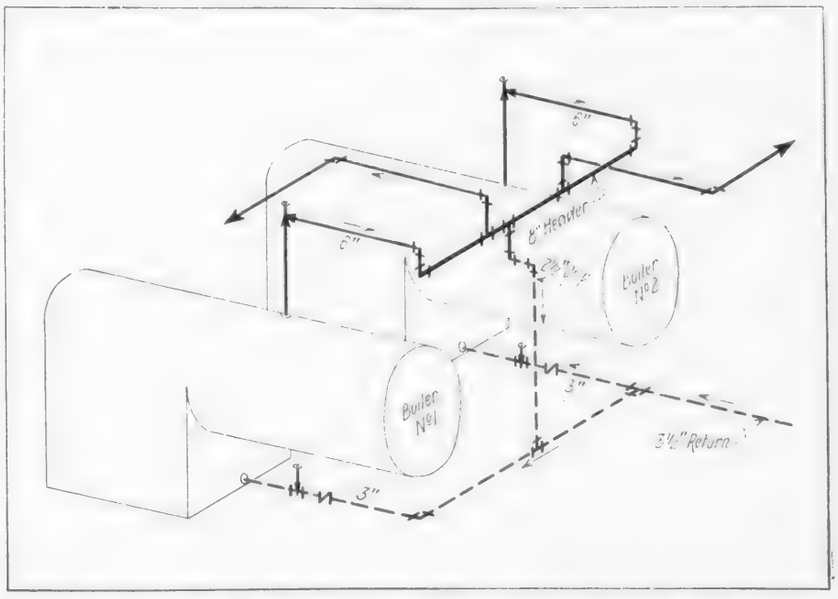


Fig. 1. Sketch of Equalization Method Causing Variable Water-Line

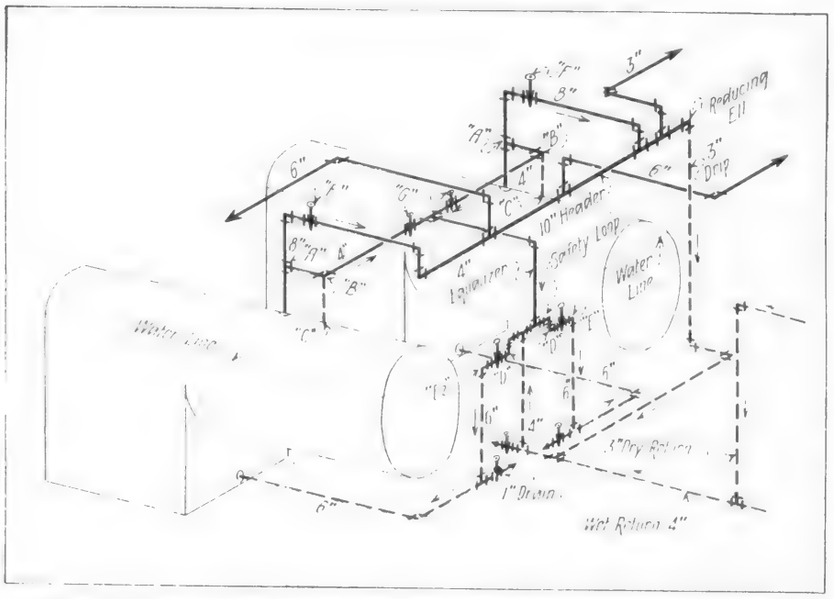


Fig. 2. Proper Method for Equalizing Water Levels of Two Boilers

communicate the true boiler pressure of one boiler to the other inasmuch as the drop in pressure takes place within the header. This drop in pressure is brought about due to the length of run, number of turns and great weight of steam flowing in the header.

BEST METHODS TO USE FOR EQUALIZATION

The best method of equalization is to cross-connect the boilers as at "C" (Fig. 2) if a tapping is available, otherwise at "A" taking the connection off the vertical of each boiler lead in order to prevent condensation from entering the equalizer, as the condensation might cause pounding in the horizontal of the safety loop and also bring about a disturbance of the pressure as communicated to this point.

In Fig. 2 it should be noted that the leads from the boiler drop to the header, while the mains rise from the header. The header is continued full size to the drip, which purposely is kept separate from the equalizer, as it is hard to combine the functions of both in one pipe and yet retain the feature of true equalization. Each boiler is valved for hydrostatic test, if required, and for separate operation, and is also provided with a draw-off separate from that of the system. These drains should spill over a floor drain or have other visible outlets. Valves "F" could be installed in the vertical leads below "A," in which case valves "G" could be eliminated, provided that the collecting of water above "A" is not objectionable when one boiler is valved off.

In order to prevent water-hammer, due to the mingling of the steam with water in the horizontal pipe forming the top of the safety loop as the water surges, it is advisable to keep the inside of the top of this pipe 2 in. below the boiler waterline, and for the same reason it is a good precaution to shorten the horizontal as much as possible. If this cannot be done, drop immediately for a few inches to points "D" and then continue the horizontal to points "E" or as much farther as may be necessary.

Giesecke's "Friction of Water in Elbows"

About two years ago a distinct addition to the data available for the engineering profession was contributed by Prof. F. E. Giesecke, in the presentation of his findings regarding friction in commercial iron pipe, together with charts for practical application to pipe sizing in water heating systems.

We have now in his experiments to determine friction in fittings (University of Texas Bulletin No. 2712, "The Friction of Water in Elbows," by Professors F. E. Giesecke, C. P. Reming and J. W. Knudson, Jr.) further data which will increase the usefulness of the data referred to above.

These experiments have been conducted with great care for 90° short and long-radius elbows and 45° elbows in sizes 1-in., 1¼-in., 1½-in., 2-in., 2½-in. and 3-in. for velocities ranging from 0.4 to 2.5 ft. per second.

Without describing the methods used in making these experiments or discussing the derivation of the various formulae presented, it will be of general interest to those who are designing water heating systems, to point out some conclusions reached by Professor Giesecke and his colleagues.

We quote the text of the bulletin as follows:

"Comparing a short-radius 90° elbow with a long-radius 90° elbow, the friction in a long-radius elbow is about 63% of that in a short-radius elbow, for a velocity of 3 ft. per second and a 3-in. pipe. This percentage is reduced slightly as the velocity is increased and is increased as the pipe diameter is increased.

"Comparing a short radius 90° elbow with a 45° elbow, the friction in a 45° elbow is about 49% of that in a short-radius 90° elbow for a velocity of 3 ft. per second and a 3-in. elbow. This percentage is reduced slightly as the velocity is increased and increased as the diameter is increased.

"Comparing a long-radius 90° elbow with a 45° elbow, the friction in a 45° elbow is about 78% of that in a long-radius 90° elbow for a velocity of 3 ft. per second and a 3-in. elbow. This percentage is practically independent of the velocity and increases as the pipe diameter is increased.

"For a 1¼-in. elbow, the friction in a 45° elbow is practically equal to that in a long-radius 90° elbow. For the smaller sizes, the friction in the 45° elbow is more and for the larger sizes it is less than that in the long-radius 90° elbow.

"For elbows smaller than 3-in., the friction in two 45° elbows and one nipple is greater than that in one short-radius elbow. For larger elbows, it is less.

"A new conception of a 'no length fitting' is one worthy of consideration, and may well be adopted by those who may be making further contributions along the lines of research in friction of fittings." A discussion of this concept is given in the bulletin.

The bulletin also gives tables showing the ratio, for a given velocity and for the pipe sizes, 1-in. to 3-in., inclusive, of friction heads for long-radius, short-radius, and 45° elbows.

—A. W. MOULDER.

Fifty Million Dollars Being Spent on Natural Gas Pipelines

Over 1200 miles of pipeline are being laid in the Texas gas fields, connecting them with various markets, the aggregate expenditure being in the neighborhood of $50,000,000.

The principal lines out of this district are:

To Denver, Colo. (under construction)	410 miles
To Wichita Falls	175 miles
To Wichita Falls and Dallas	200 miles
To Lubbock and Slaton	210 miles
To Wichita, Kan. (under construction)	250 miles

The Amarillo gas field is believed to be the largest single gas field developed in the world. Located in the northwestern or Panhandle section of Texas, without any substantial market within 200 miles of its confines, development of this field was slow, following its early discovery.

Subsequent discovery of oil activated drilling in the area, until the tremendous reserve of gas became so apparent that large financial groups began the construction of trunk pipe lines to existing markets.

American Society of Heating and Ventilating Engineers

Committee on Research Requests Uniformity in Radiator Ratings

At a meeting of the Committee on Research of the American Society of Heating and Ventilating Engineers, at New York, January 23, 1928, the following resolution was adopted:

That all manufacturers of radiators be requested by the Committee on Research to publish the ratings of their product in British thermal units. These ratings are to be certified and guaranteed, and for the present, at least, are to be based on condensation performance determined substantially in accordance with the tentative code of the American Society of Heating and Ventilating Engineers for testing radiators.

Appointment of Council Committees

President A. C. Willard has announced the following council committee appointments:

Executive: Thornton Lewis, chairman; J. F. McIntire, H. Lee Moore.

Finance: W. T. Jones, chairman; J. F. McIntire, Thornton Lewis.

Membership: Roswell Farnham, chairman; W. E. Gillham, C. V. Haynes.

Publication: L. A. Harding, chairman; N. W. Downes, H. H. Angus.

Program: F. B. Rowley, chairman; John Howatt, W. H. Carrier.

Semi-annual meeting: E. B. Langenberg, chairman; F. Paul Anderson, J. J. Kissick.

President Willard Guest of Illinois Chapter

Prof. A. C. Willard made his first chapter visit, as president of the A.S.H. & V.E., to the Illinois Chapter at its February meeting held February 13, at the Sherman Hotel, Chicago. His subject was "Heating and Ventilating the Halls of Congress of the United States." Professor Willard discussed many of the problems involved and told of the appointment of a committee of engineers to draft plans and secure bids for the installation. He stated that an examination of the proposals submitted shows a wide variety in the types of equipment and methods proposed by the different contractors. There is also a wide range in the bid prices.

Secretary H. G. Thomas made the interesting announcement that the next annual meeting of the A. S. H. & V. E. will be held in Chicago, January, 1929.

Patrick O'Connell, of the Richmond Radiator Company, was elected a member of the chapter.

New York Chapter Hears Talk on Industrial Marketing

Merritt Lum, of the Marketing Counsel Staff for the McGraw-Hill Company, was the principal speaker of the February meeting of the New York Chapter, held February 20, in the new club rooms of the Building Trades Employers' Association at 2 Park Ave., New York. Previous to the dinner, the members had an opportunity to inspect the club's quarters, which were greatly admired.

Mr. Lum's address was illustrated with lantern slides and included, among other things, the results of a survey from a dozen cities in the eastern industrial area covering every manufacturing plant in those cities. One of the striking facts brought out in the survey was that less than 4% of the manufacturing plants employed 37% of the workers and did over 58% of the total business in those cities. Another important fact brought out by Mr. Lum was that the engineering steps of industrial plants range close to the top in having the say as to the purchase of equipment.

In opening the meeting President R. A. Wolff announced the death of Thomas Barwick, a chapter member of the society, and the chapter voted to draw up a suitable resolution to be sent to his family.

For the Nominating Committee, Chairman A. S. Armagnac presented the following ticket: For president, H. Berkley Hedges; for vice-president, E. J. Ritchie; for secretary, Edward B. Johnson; for treasurer, F. E. W. Beebe; for the board of directors, R. A. Wolff, Alfred J. Offner and Dr. Charles W. Brabbée.

Michigan Chapter

President A. A. Landon, of the Landon Radiator Co., Buffalo, N. Y., and Fred Johnson, of the Johnson-Larsen Company, were the principal guests at the February meeting of the Michigan Chapter, held February 13, at the Imperial Hotel, Detroit. Covers were laid for 75 members and guests. Mr. Landon devoted his remarks to past, present and future activities in the boiler and radiator industry. Mr. Johnson spoke on "Fads, Fancies and a Few Facts Relating to the Heating Industry."

Michigan Chapter

Samuel R. Lewis was the principal speaker at the January meeting of the Michigan Chapter, held at the Imperial Hotel, Detroit, January 16. President Calvert introduced Mr. Lewis as chairman of the Research Committee. Mr. Lewis discussed the activities in connection with the research work among the various universities throughout the country. Many of the universities are co-operating and co-ordinating in special research. Mr. Lewis showed many slides.

Forty-eight members and guests were present. It was decided to extend an invitation to the A. S. H. & V. E., to hold its semi-annual meeting in Detroit during 1930.

Mrs. Frank Addresses Pittsburgh Chapter

Mrs. Olive E. Frank, president of the O. E. Frank Heater & Engineering Co., Buffalo, N. Y., was the principal speaker at the February meeting of the Pittsburgh Chapter, held at the William Penn Hotel, February 6. Her subject was "Heat Interchangers."

Warm-Air Furnace Heating Surface Defined

From the February bulletin of the National Warm-Air Heating and Ventilating Association is taken a definition of heating surface as applied to warm-air furnaces, the definition being the formulation of the Research Advisory Committee as a result of its activities in measuring furnaces and determining their rates.

"Heating surface is that surface within the furnace casing which is exposed to the fire or the products of combustion on one side and to the air on the other.

"Measure the bottom inside diameter of the firepot above the grates, making measurement on four diameters and to accuracy of ⅛ in. . . . If the grate level is below the ashpit joint include as heating surface the vertical portion of the ashpit above the grate level. . . . Cemented joints on the outside of castings are to be included as heating surface. . . . When surfaces so irregular as to be impossible of linear measurement are found they may be measured by fitting paper templates, to cover the surface, and planimetering these papers. . . . Fins when integral parts of a furnace casting are to be measued as follows:

"(a) The first 2 in. allowed in full.

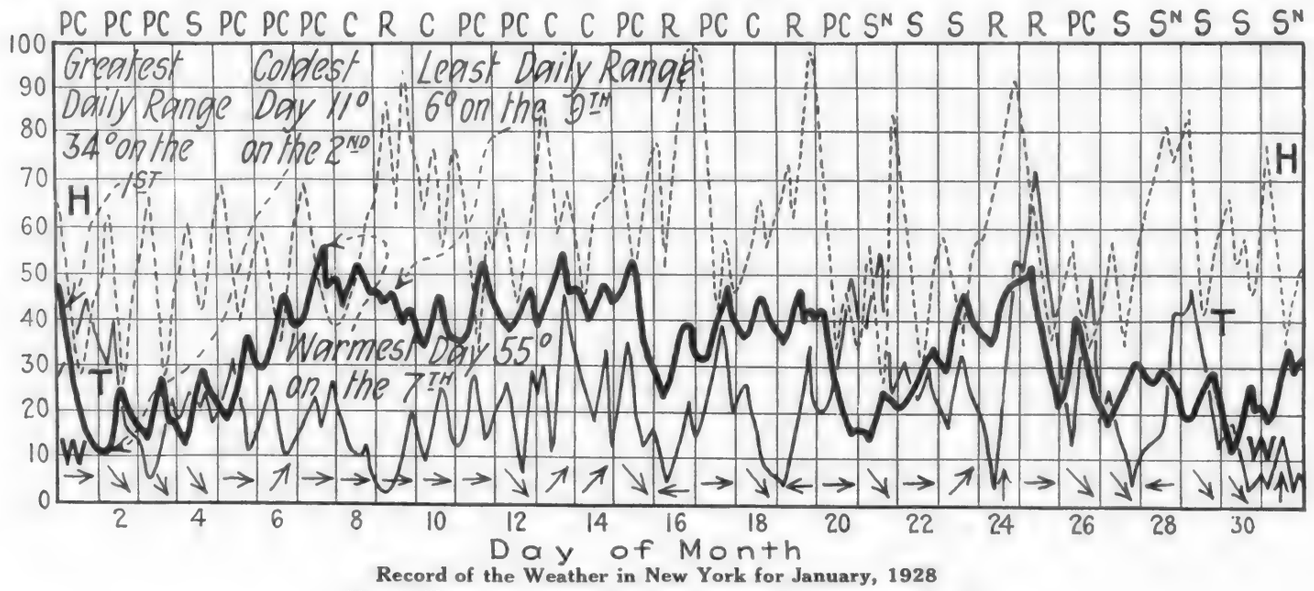
"(b) The next 2 in. at half area.

"(c) All beyond 4 in. no allowance.

"Webs, lugs, ribs, and other small *structural* parts which are integral with the main heating elements of the furnace are included as heating surface."

The Weather for January, 1928

	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	55	58	62	60	71
Date of highest temperature	7	1	14	14	14
Lowest temperature, degrees F.	11	11	2	—6	—5
Date of lowest temperature	2	30	1	2	1
Greatest daily range, degrees F.	34	38	29	27	28
Date of greatest daily range	1	1	15	19	12
Least daily range, degrees F.	6	4	4	4	5
Date of least daily range	9	8	8	7	18
Mean temperature for month, degrees F.	33.8	33.0	30.8	25.2	34.7
Normal mean temp. for month, degrees F.	30.9	27.8	30.5	23.7	31.2
Total rainfall, inches	1.41	1.66	1.30	0.73	1.91
Total snowfall, inches	3.0	5.1	1.2	0.2	1.1
Normal precipitation, this month, inches	3.66	3.61	3.05	1.90	2.34
Total wind movement, miles	14712	8082	9302	8840	9234
Average hourly wind velocity, miles	19.8	10.9	12.5	11.9	12.4
Prevailing direction of wind	W.	S.W.	S.W.	S.W.	S.W.
Number of clear days	8	10	4	11	15
Number of partly cloudy days	15	9	13	8	7
Number of cloudy days	8	12	14	12	9
Number of days on which rain fell	9	11	10	7	4
Number of days with snow	5	6	2	One	2
Snow on ground at end of month, inches	1.4	2.3	0.1	Trace	Trace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Least Daily Range 6° on the 9TH
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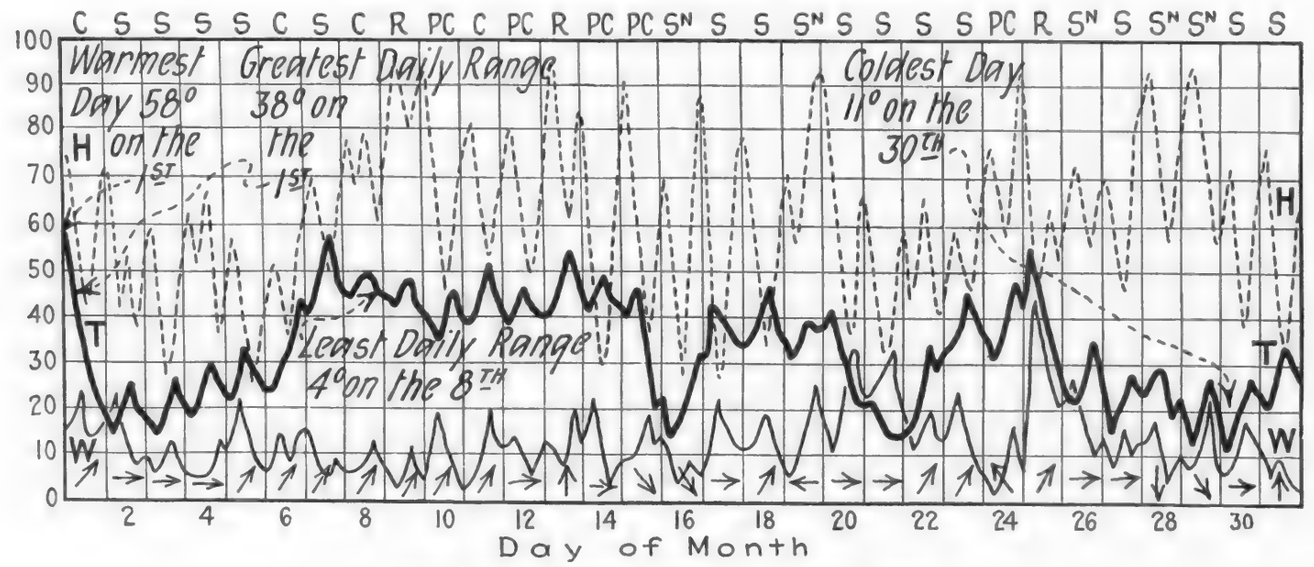
Record of the Weather in New York for January, 1928

(Hourly Observations of the Relative Humidity Plotted on this Chart)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Warmest Day 58° on the 1ST
Greatest Daily Range 38° on the 1ST
Coldest Day 11° on the 30TH
Least Daily Range 4° on the 8TH
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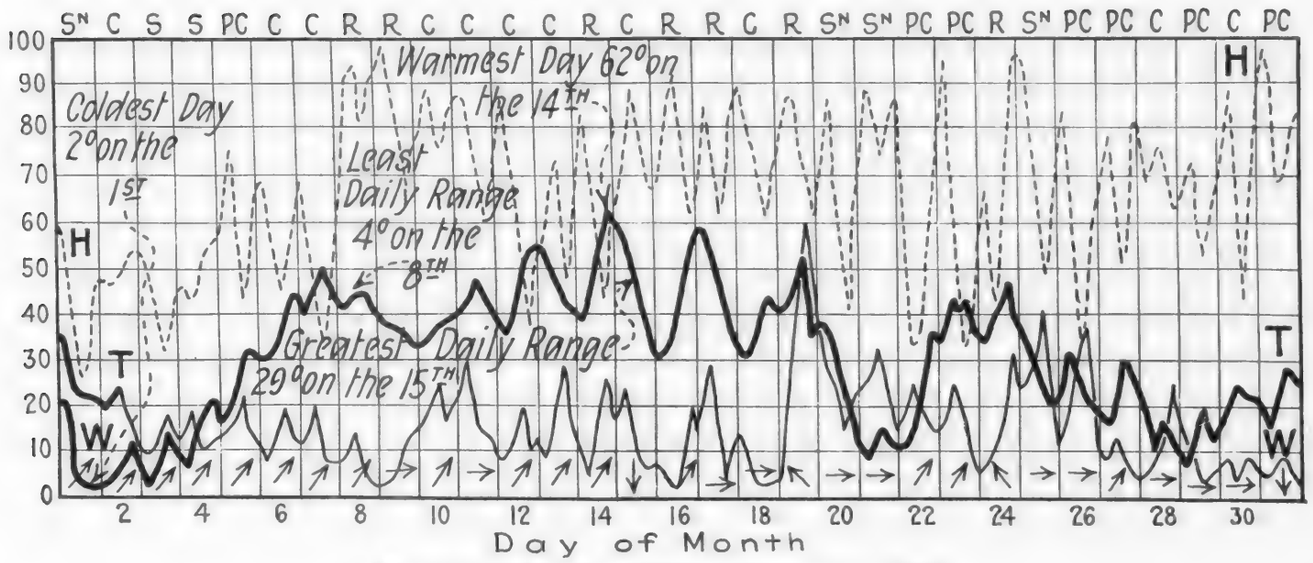
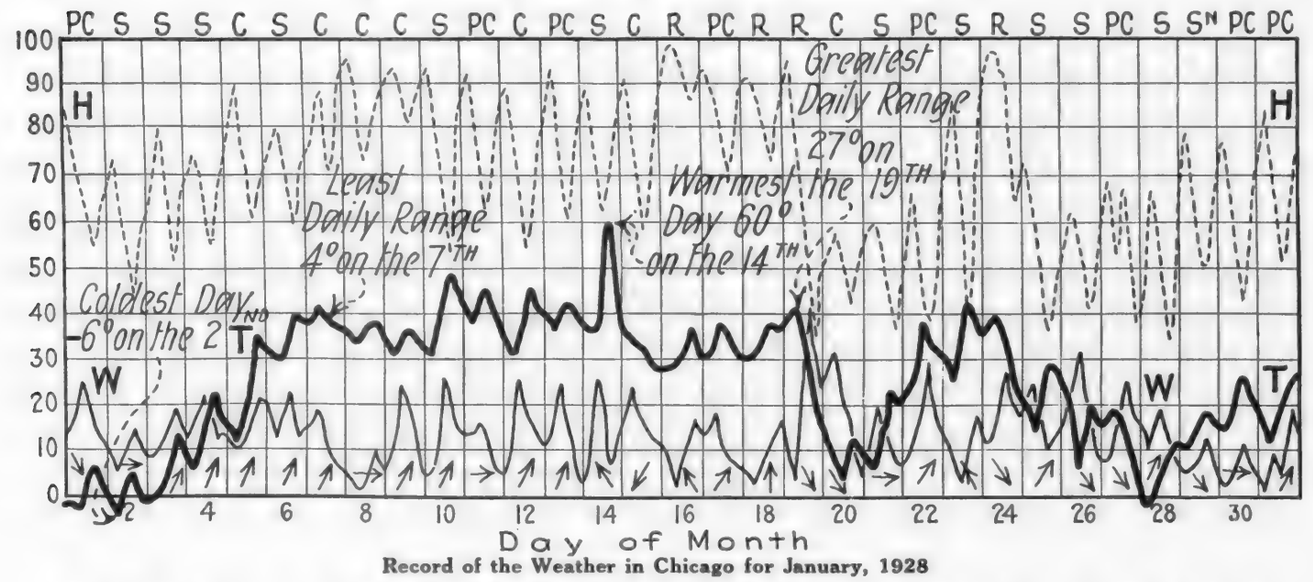
Day of Month

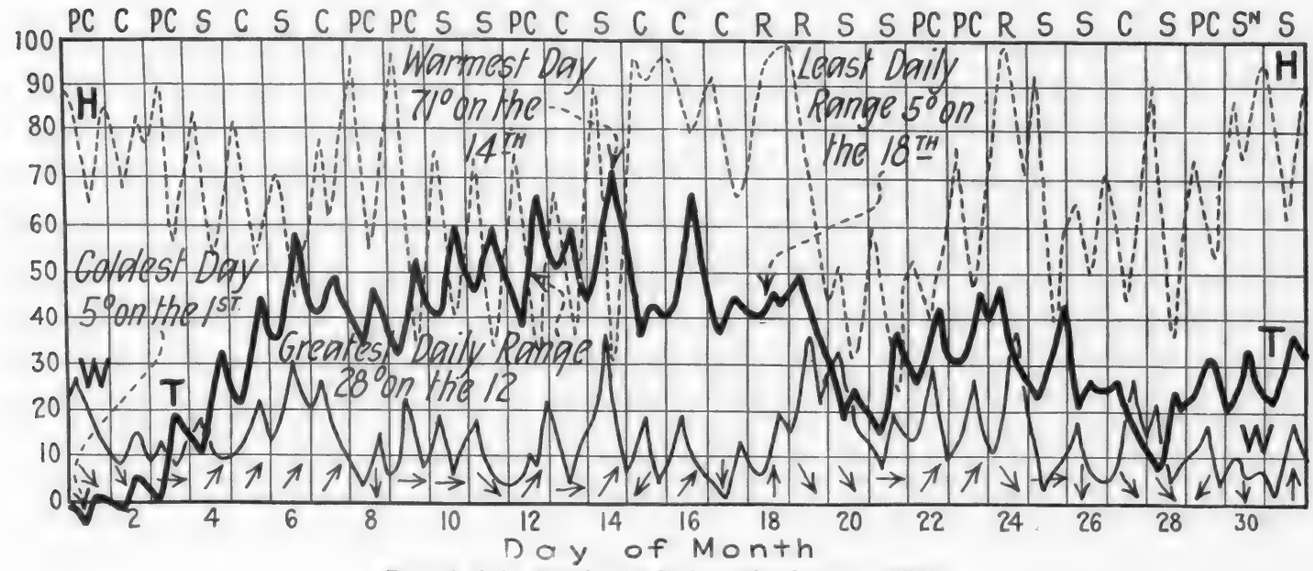
Record of the Weather in Boston for January, 1928


Warmest Day 62° on the 14TH
Coldest Day 2° on the 1ST
Least Daily Range 4° on the 8TH
Greatest Daily Range 29° on the 15TH
Day of Month

Record of the Weather in Pittsburgh for January, 1928


Greatest Daily Range 27° on the 19TH
Least Daily Range 4° on the 7TH
Warmest Day 60° on the 14TH
Coldest Day 6° on the 2ND
Day of Month

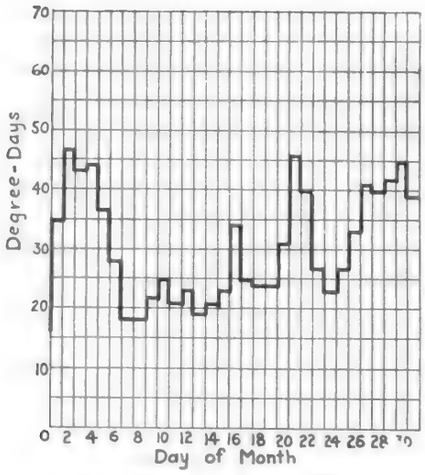
Record of the Weather in Chicago for January, 1928


Warmest Day 71° on the 14TH
Least Daily Range 5° on the 18TH
Coldest Day 5° on the 1ST
Greatest Daily Range 28° on the 12
Day of Month

Record of the Weather in St. Louis for January, 1928

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperatures in degree F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M., 12 M., and 8 P.M.
S—Clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow. Arrows fly with prevailing directions of wind.

Monthly Heating Loads in Degree-Days In Five Typical Cities

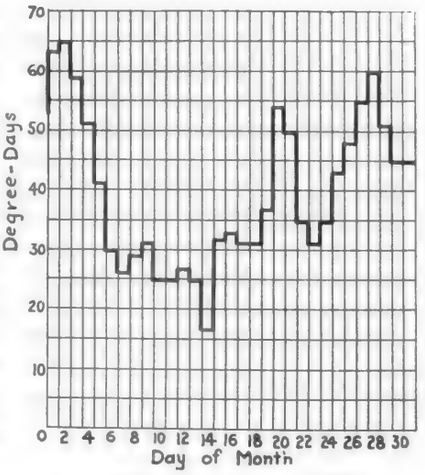


New York, January, 1928
Degree-Days 970—Degree-Days to January 31, 1849

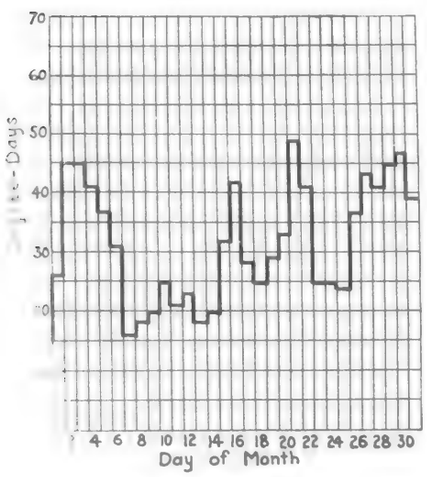
THESE charts show graphically the heating load in New York, Boston, Pittsburgh, Chicago and St. Louis.

The integration of each monthly curve is given in degree-days; also the total heating load for the current heating season, to date.

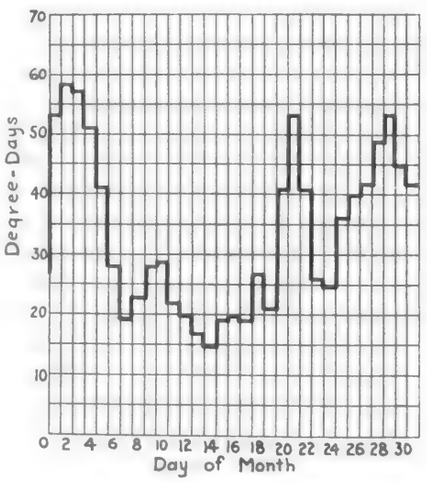
The December issue contained the first charts in the series. They are so drawn that the continuous heating load for any city can be built-up by cutting out the several charts and pasting them along a pencilled base line. The story of this method of measuring the heating load, and some of the many applications, will be found in THE HEATING AND VENTILATING MAGAZINE for September and November, 1925.



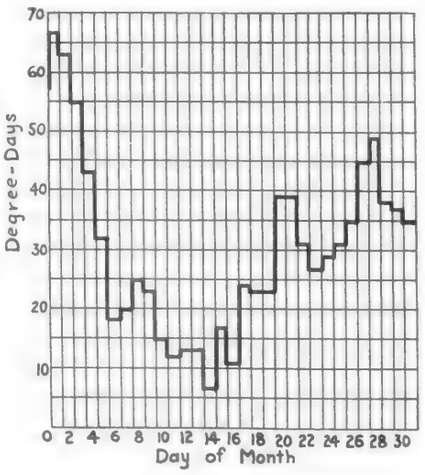
Chicago, January, 1928
Degree-Days 1230—Degree-Days to January 31, 2411



Boston, January, 1928
Degree-Days 991—Degree-Days to January 31, 1890



Pittsburgh, January, 1928
Degree-Days 1060—Degree-Days to January 31, 2031



St. Louis, January, 1928
Degree-Days 939—Degree-Days to January 31, 1948

Simplified Practice Extending Rapidly

In a review of the past year's activities of the Commercial Standards Group, Bureau of Standards, by Ray M. Hudson, assistant director in charge, there is found specific evidence of wider adherence to the doctrine of simplified practice throughout the country. In fifteen simplified practice recommendations already promulgated, the report shows that acceptors, representing an average of 82.6% of the total volume of the industry affected, are following the simplified practice schedules. The list of associational endorsers grew from 686 to 898 during the year, and the individual concerns from 2775 to 6676. This means that an increasing number of industrial purchasers are specifying simplified lines when buying because they are finding that such items are more readily obtained; that the quality is better; and in many instances by reason of the savings wrought through simplification, prices are lower. As a result of this report, it is prophesied that with the expiration of another 18 to 24 months, nearly 100% endorsement will be given to simplified practice. In his report, Mr. Hudson cites a number of experiences in connection with this form of waste elimination, showing that the program for simplified practice has many substantial dollars-and-cents virtues to recommend it.

Midwest Power Conference

One of the principal speakers at the Midwest Power Conference, held at the Stevens Hotel, Chicago, February 14-17, was Alexander Dow, president of the Detroit Edison Company and of the American Society of Mechanical Engineers. Mr. Dow's talk was devoted to recent economic tendencies in the central station field. Other speakers at the conference were George A. Orrok, consulting engineer for the New York Edison Company; I. E. Moultrop, of Boston; Thomas E. Murray, of New York; T. A. Peebles, of the Hagan Corporation, and Prof. S. W. Parr.

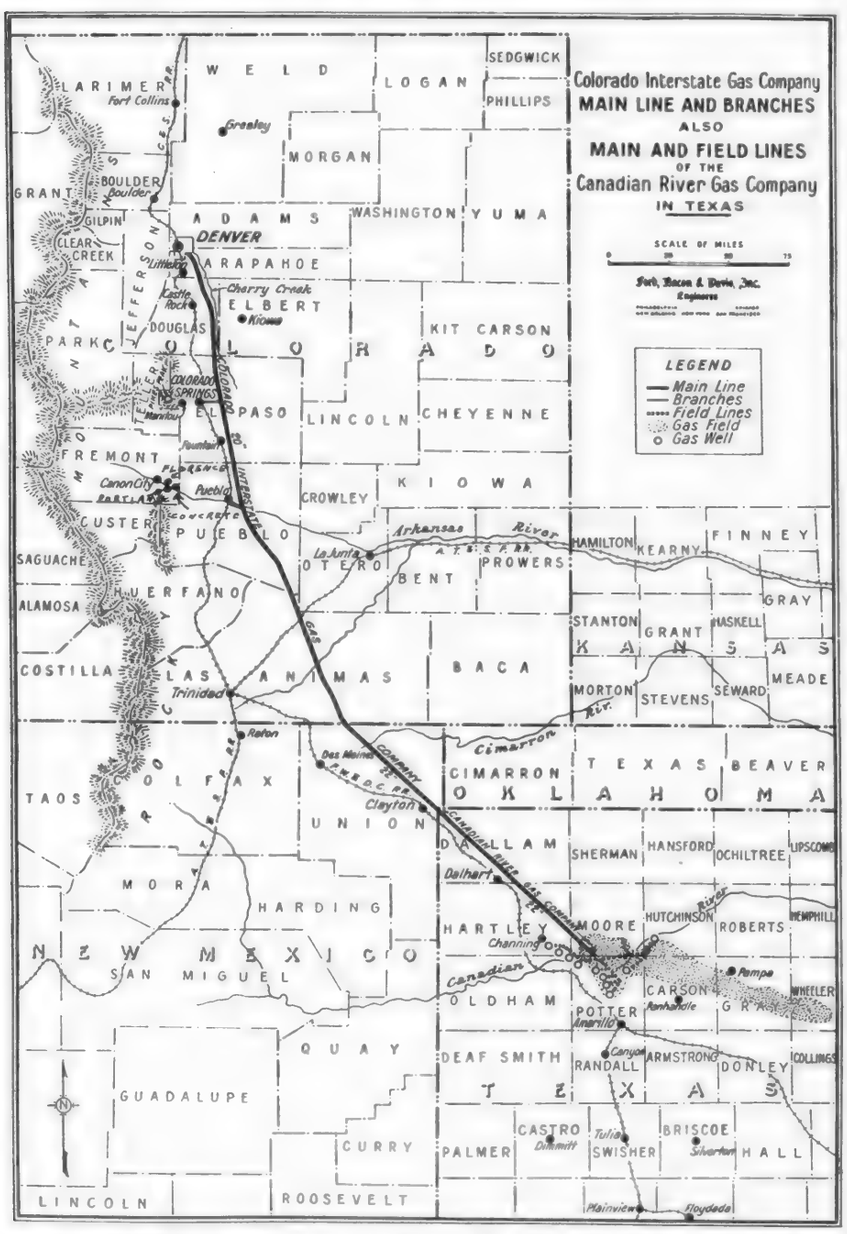
The Power Show, which was held in conjunction with the conference, included no less than 250 exhibits.

Great Pipe Line to Serve Denver With Natural Gas

Built at a cost of more than $25,000,000, the largest gas pipe-line in the world will shortly be opened between a tremendous gas-bearing area in the Panhandle district of Texas and the city of Denver, Colorado. The gas will be produced or gathered by the Canadian River Gas Company and piped through a 22 in. line to Clayton, New Mexico, a distance of about 86 miles. From this point the gas will be taken over by the Colorado Interstate Gas Company, a subsidiary of the Standard Oil Company of New Jersey. The Colorado corporation will sell its gas wholesale to the Public Service Company of Colorado for distribution in Denver and to the Pueblo Gas and Fuel Company for sale in Pueblo. It also will supply gas to Colorado Springs and in large quantities for industrial purposes to the Colorado Fuel and Iron Co., Pueblo. The pipe line will aggregate 350 miles in length and a telephone line will be built along the right of way.

A number of difficult construction problems have been solved in crossing the Canyon of the Purgatoire, the Arkansas River and many rocky canyons that abound in this district. Nearly 82,000 tons of pipe will be required for this contract.

It is understood that exceptionally favorable rates will be available to residents of the territory served, for house heating and cooking purposes.



This 350-Mile Pipe Line Conveys Natural Gas From the Panhandle Field in Texas to Denver and Other Cities

Gas Interests to Study Coal at the University of Michigan

Co-operative research by the Michigan Gas Association at the University of Michigan will be carried out in the university laboratories under the direction of Assistant Professor E. S. Pettyjohn, through the operation of a gas-engineering research fund of $10,000, provided by the Michigan Gas Association. The problem is designated as "an evaluation of bituminous coals as water-gas generator fuel." In other words, what coals will yield the best results when used as fuels for the generation of water gas, and what actually constitutes the water-gas-making properties of bituminous coal. Professor Pettyjohn, assisted by David A. Fox, holder of the Michigan Gas Association Fellowship at the University of Michigan, will carry on this study at the Marysville gas plant of the Detroit Edison Company, which is cooperating in the work. It is hoped to make tests of six or more leading gas coals before July, when the Michigan Gas Association holds its annual convention at Mackinac Island.

Gas—The Awakened Giant

A survey of present markets for manufactured gas and a prediction of tremendous markets for the future is the basis of a booklet issued by the American Gas Association, which contains much statistical data on this subject. Many of the figures given indeed are astounding.

The capital invested in the manufactured gas industry is more than $2,700,000,000; nearly 12,000,000 customers are served, and the annual revenue is more than $500,000,000.

Estimates are made that 20% of the bituminous coal now used could be replaced by manufactured gas, this being about equally divided between coal used for domestic and for industrial purposes, excluding the iron and steel industries. Also it is estimated that gas ultimately can replace 75% of the anthracite now used for domestic and industrial purposes and 75% of the oil used for house heating and for industrial heat-treating. The aggregate of these replacements is a potential market for gas that is about sixteen times greater than the present total send-out. One of the most important fields for consideration is the house-heating load, and startling figures are given to show the possibilities in this realm.

To indicate the possibilities for the use of gas in industrial plants, it is stated that the Ford Motor Company at its River Rouge plant alone, uses approximately 50,000,000 cu. ft. of gas per day, or enough to supply a city of 5,000,000 population. The booklet deals at length with the activities of the Testing Laboratory of the American Gas Association and with the expenditure of $500,000 for scientific research.

American Oil Burner Association

Plans Completed for Fifth Annual Convention in Chicago, April 3-5

PLANS for co-operation by the oil producers and the electric light and power companies in serving the users of oil-heating apparatus will be one of the important topics discussed at the fifth annual convention of the American Oil Burner Association, to be held at the Hotel Stevens in Chicago, April 3-5. A representative of one of the large electrical companies will speak on the relation of the central station to the oil-heating industry, and the interest of the oil producers in the utilization of oil fuel by owners of homes and commercial buildings will be discussed by an official of one of the large oil companies, whose name has not yet been announced.

One of the features of the convention will be the showing of the Bureau of Mines' motion picture, "The Story of Petroleum."

There will be two sessions for manufacturers devoted, respectively, to engineering problems and organization and management problems, and two dealers' sessions, one devoted to organization and management and the other to sales and service. Edward James Cattell will be the principal speaker at the annual dinner to be held on the evening of April 4.

Leod D. Becker, managing director of the association and of the Oil Heating Institute, in his annual report, will present details of the educational program being carried on by the institute.

Among the subjects on the program are: "Why We Have General Trade Practices," "Are We Making Progress in Fundamental Engineering?" "Installation Regulations and Other Factors in the Cost of Installed Equipment," "What Competition May We Expect from Other Fuels?" "Organizing a Sales Force," "The Selection and Training of Dealers," "The Manufacturer and Service," "The Importance of a Complete Line of Equipment," "The Relation of the Indirect Heater to Oil Burners in the Heating of Domestic Water," "Automatic Oil Heating Service as Distinguished from the Oil Burners for Sale," "Co_2 and Its Relation to Burner Adjustment," and "What Price Service!"

In connection with the convention there will be an exposition illustrating the development of the oil-burner equipment, with displays of everything entering into the manufacture, installation and use of oil burners.

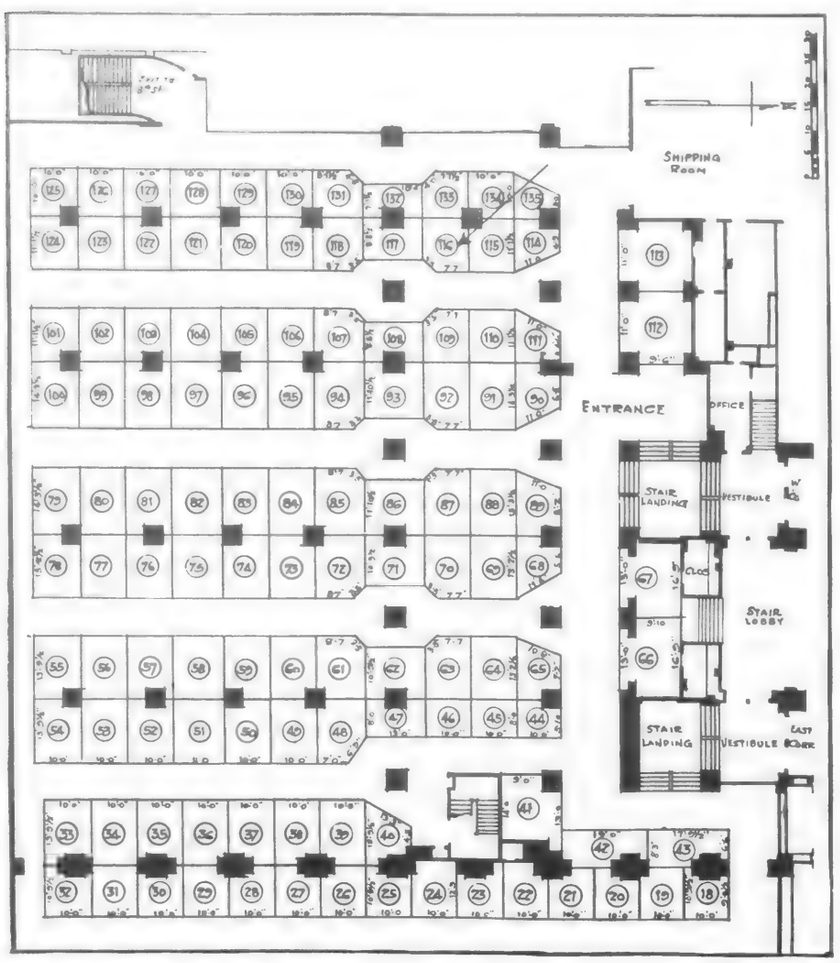


Diagram of Exhibition Hall, American Oil Burner Association Convention, April 3-5

Arrow indicates booth of The Heating and Ventilating Magazine

Exhibitors

BOOTH NO.	
87–89	Absolute Con-Tac-Tor Corp., Elkhart, Ind.
90–92	American Nokol Co., Chicago, Ill.
42–43	American Radiator Co., Chicago, Ill.
54	Automatic Burner Corp., Chicago, Ill.
96	Baker Steam Motor Car & Mfg. Co., Pueblo, Colo.
63	Bettendorf Oil Burner Co., Betendorf, Ia.
76	Breese Engineering Corp., Chicago, Ill.
80	Bryan Steam Corp., Peru, Ind.
59	Bunting Iron Works, Berkeley, Calif.
71	Caloroil Burner Corp., New York, N. Y.
118	Century Electric Co., St. Louis, Mo.
119–120	Cleveland Steel Products Corp., Cleveland, O.
61	Combustion Fuel Oil Burner Co., Milwaukee, Wis.
98	Cook Electric Co., Chicago, Ill.
94	Dongan Electric Mfg. Co., Detroit, Mich.
77	Economy Heat Unit Co., Minneapolis, Minn.
112A	Electrol Inc. of Missouri, St. Louis, Mo.
115	Enterprise Oil Burner Co., San Francisco, Calif.
112–113	Federal Gauge Co., Chicago, Ill.
66–67	Fuel Oil Magazine, New York, N. Y.
58	General Electric Co., Schenectady, N. Y.
135	Gulf Oil Burner Co., Philadelphia, Pa.
93	Hardinge Brothers, Inc., Chicago, Ill.
116	The Heating and Ventilating Magazine, New York, N. Y.
104	Holby Corp., Frank A., New York, N. Y.
108	Iroquois Electric Co., Philadelphia, Pa.
28	Jefferson Electric Mfg. Co., Chicago, Ill.

85	Johnson Co., S. T., Oakland, Calif.
111	K. W. Ignition Corp., Cleveland, O.
122	King-Seeley Gage Co., Ann Arbor, Mich.
110	Liquidometer Co., Long Island City, N. Y.
100–101	May Oil Burner Corp., Baltimore, Md.
86	McAlear Mfg. Co., Chicago, Ill.
56	McDonnell & Miller, Chicago, Ill.
75	McIlvaine Burner Corp., Evanston, Ill.
81–84	Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
68–70	Nu-Way Corp., The, Rock Island, Ill.
45	Wm. H. Pascoe Co., Inc., Chicago, Ill.
44,64-65	Petroleum Heat & Power Co., New York, N. Y.
123–124	Preferred Oil Burners, Inc., Peoria, Ill.
72–73	Silent Automatic Corp., Detroit, Mich.
114	Super Oil Heator Co., East Hartford, Conn.
107	Sword & Kimber Co., Philadelphia, Pa.
74	Teesda'e Mfg. Co., Grand Rapids, Mich.
98–99	Timken-Detroit Co., Detroit, Mich.
109	Titeflex Metal Hose Co., Newark, N. J.
79	Tuthill Pump Co., Chicago, Ill.
97	Webster Electric Co., Racine, Wis.
48	Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Petro Sales Plan Announced

It is announced by the Petroleum Heat and Power Co., 511 Fifth Ave., New York, that plans for a nation-wide campaign for domestic oil-burner sales have been completed and will be put into effect as rapidly as may be possible. The sales organization will be based on the distributor-dealer sales plan. This will call for 66 main distributors throughout the eastern portion of the United States and Canada. Each distributor will maintain both a retail and wholesale department, the former doing business within a 15-mile radius. Outside of this territory each distributor will build up his own dealer organization. There will be six main divisional territories as follows: New England, New York State and Canada, New York Metropolitan area, Philadelphia area, including nearby cities and Baltimore and Washington, Southern territory, Central territory, consisting of Michigan, Wisconsin, Indiana, Minnesota, Iowa and Missouri. Divisional sales-managers will have charge of these offices.

Pascoe Burners' Radio Program

The William H. Pascoe Co., Inc., 1314 Belden Ave., Chicago, will be on the air from WMBB, Chicago radio station, with a Pascoe hour every Wednesday evening, offering a general program of entertainment.

Timken-Detroit Company Buys Socony Burner Business

Timken-Detroit Company has purchased the oil-burner business of the Socony Burner Corporation. In 1925, the Timken company arranged with the Socony company to handle the sales and servicing of Arrow burners to various sections of the United States, other than in New York State, and the New England States, which territory was handled by the Socony company exclusively. Believing that the interests of owners of these burners would best be served by a single control of all sales and service problems, the business recently was sold to the Timken-Detroit company. They have assumed direction of service stations, including the trained personnel, and payments on contracts for burners now will be made to the Timken company.

First Meeting of the Canadian Plumbing and Heating Guild

Under the new name of the Canadian Plumbing and Heating Guild, this organization held its first annual meeting in Toronto, January 24-26, with an attendance of over 500 heating and plumbing contractors. In his address, President Roy E. Belyea announced that the program of the guild for 1928 would include the further extension of credit service, installation of bookkeeping and cost keeping systems, and instruction in their use, where necessary; discouragement of improper trade practice, the establishment of provincial plumbing and heating regulations, and exemplification and standardization of regulations, the standardization of plumbing and heating materials, standard contract forms, the setting up of guild standards for plumbing and heating installations for the protection of the public; the setting up of an arbitration department for the settlement of disputes as between members and the public, and the establishment of right relations with customers and with the community; the study of the seasonal unemployment situation as affecting our industry; the dissemination of guild ideals and organization of those provinces of Canada which ask that the gospel of the guild be carried to them.

Oil-O-Matic on the Air

Reaching out and spreading the name and fame of Oil-O-Matic oil burners, the Oil-O-Matic hour will take its place on the program of WGN, Chicago; KDKA, Pittsburgh, WBZ, Springfield, and WBZA, Boston. The proposed program is an elaborate one replete with high-class numbers. It is interesting to note that the station house WGN, located near Elgin, Illinois, has been heated by an Oil-O-Matic burner for more than two years.

Oil-Burner Dealers in Minneapolis and St. Paul Organized

The Twin Cities Oil-Burner Association, composed of Minneapolis and St. Paul dealers and others in the industry, was recently organized, and immediately started action on several plans intended to benefit the members and the oil-burner business. It is planned to hold an oil-burner exhibit for the public under the auspices of the association soon after the American Oil Burner Association convention in Chicago.

The officers are: President, C. H. Chalmers, past president American Oil Burner Association; vice-president, C. E. Campbell; secretary, S. F. Ellertson, Preferred Oil Burners, Inc. The committee in charge of the exhibit is composed of the following: Chairman, Ray Porter, Belden Porter Co.; Ben Boalt, Minneapolis-Honeywell Regulator Co.; C. E. Bird, Bird Burner; C. E. Campbell, Camel Burner; Mr. Gratz, Chalmers Burner; and Mr. Phayer, Sundstrand Burner. The association plans to hold a dinner meeting every alternate Monday.

Oil-O-Matic Burner Talks to Rotary and Kiwanis Club Members

A novel "stunt" recently was put on for the benefit of members of the Rotary and Kiwanis Clubs in Illinois, when nearly 150 business men in each organization participated in a luncheon in the factory of the Williams Oil-O-Matic Heating Corporation, at Bloomington.

The parts of a new model J Oil-O-Matic burner were put together, and the burner was started, in 5½ minutes and the guests were then startled by the burner apparently addressing them, carrying on a conversation with various guests, giving information about itself and winding up by asking for a drink of fuel oil. This was accomplished through the medium of a concealed loud speaker, connected by carefully hidden wires with a transmitter in an adjacent room, where an operator supplied the voice that apparently came from the burner.

Minneapolis-Honeywell Company Entertains Twin Cities Oil-Burner Association

The Minneapolis-Honeywell Regulator Company was host, January 30th, in its Minneapolis plant at a dinner meeting of the Twin Cities Oil Burner Association. C. H. Chalmers, president of the association, presided, and brief addresses were made by A. P. Mudgett and B. L. Boalt of the Minneapolis-Honeywell Regulator Co. Thirty-five dealers and others identified with the oil-burner industry were guests.

Domestic Oil Burners of To-day

Stabilized Design and the Presentation of Junior Sizes the Outstanding Features of the 1928 Season

THE symposium that follows is intended to describe briefly burners having a national or semi-national distribution and designed for the heating of homes. Naturally, it is hard to draw a distinct line of demarcation between house-heating burners and those that may be applied to industrial heating, to commercial heating or to the heating of hotels, office buildings, schools, and churches. In some instances a burner adaptable to the smallest home and one that can be used to fire the largest low-pressure boiler differ only in size. In other cases the domestic burner is distinctly limited to a maximum load, above which it cannot be enlarged.

It must be understood that the amount of text describing any particular burner is no criterion, either of the merits of the burner or of its standing in national sales. In some cases the manufacturers have stabilized design to such a degree that there is little change in the burner from year to year. Consequently, it is necessary only to list these burners and identify them as to type. In other cases, where new models have appeared, it is desirable to describe more completely the new features.

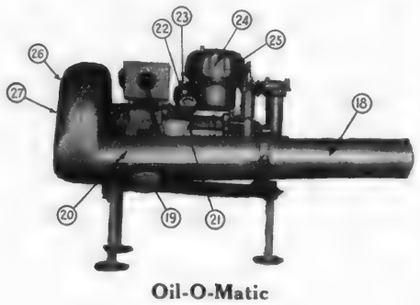
Oil-O-Matic

The 1908 model of the Oil-O-Matic oil burner is known as Model J and is manufactured by the Williams Oil-O-Matic Heating Corp., Bloomington, Ill. This new burner follows the principles of its predecessor, but has been refined in many ways, and in particular special attention was paid to the tooling that would be necessary to put it into production on a large scale.

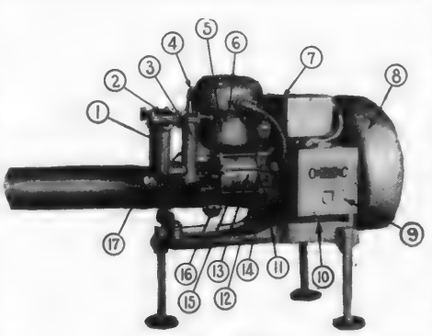
The design has been simplified and many parts formerly considered necessary have been eliminated entirely and both weight and size of those remaining have been reduced by the employment of better and more expensive materials. The oil strainer is now die-cast of aluminum and attached directly to the oil-valve housing without any pipe fittings (No. 1). The oil-strainer cover also is die-cast of aluminum and placed on a special composition cork gasket, another gasket of the same kind being placed between the strainer screen frame and housing (No. 2). The oil-valve housing and metering-pump housing (No. 3) are die-cast of aluminum and a stuffing box done away with, a flexible metallic bellows being used. The oil valve adjustment (No. 4) is obtained through a hardened steel ball.

No. 5 is the die-cast aluminum housing for two special flexible metallic bellows which act as a dash-pot in connection with the control mechanism of the burner. A special socket for the high-tension cable terminal of the transformer (No. 7) minimizes the chance of short circuit.

The fan housing is pressed from sheet steel. No. 9 is the safety-control-box housing the mercury tube safety unit, while No. 10 is the special rubber fabric motor cushion, isolating mechanical noises from the blower as well as from the furnace or boiler. This also deadens the hum of the motor. No. 11 is the motor end-cell incorporating the air intake as well as a relief chamber for pressure adjustment. The motor (No. 12) has been specially designed for the Model J Oil-O-Matic burner. It is of the repulsion-induction type with large ball bearings at both ends of the shaft.



Oil-O-Matic

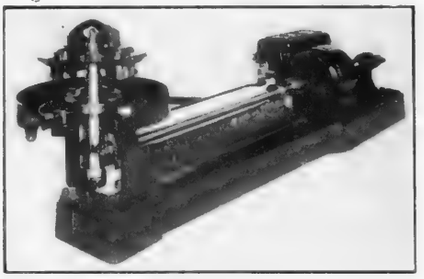


Oil-O-Matic

After extensive research an alloy iron was developed for the atomizing cylinder (No. 13). To balance the entire unit, a three-point suspension motor base was adopted. This, No. 14, embodies a reservoir to catch any oil that may be in the burner when it is serviced. The metering pump (No. 15) has been simplified and the number of its parts reduced. As it is important that every burner should have its draft pipe at the proper angle when installed, the Model J draft pipe (No. 18) has this angle built into the burner itself so that the motor and all moving parts are perfectly level while the draft pipe is inserted in the fire box at the proper angle. A new feature is an improved draft regulator (No. 19) forming a part of the draft pipe and readily adjusted. This also is true of the end draft pipe, No. 20. To insure the proper operation of every individual installation, the pressure adjusting screw (No. 21) is used in connection with the pressure gauge (No. 22). The air intake is provided with a muffler, No. 23. The remaining numbered parts shown in the illustration are as follows: No. 24, removable plate which may be replaced by a gas valve when the latter is used; No. 25, control mechanism casing, protecting the entire control from dust, and preventing tampering with the mechanism; No. 26, pressed-steel fan, which is the result of extended research and experiment to combine light weight with absence of vibration; No. 27, fan-housing screen. When suction pump is used, this screen is replaced by a plate supporting the suction pump, the latter being driven by a flexible drive coupling.

Aetna

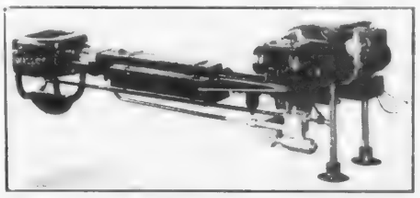
The Aetna burner for nearly ten years was produced by Aetna Automatic Oil Burners, Inc., Providence, and now, following a merger of this company with the American NoKol Company, is produced in the NoKol factory in Chicago. The Aetna burner has undergone changes of only a minor character during the eight or nine years that it has been on the market. It consists of a horizontal rotating disc located approximately at the grade level, and is driven by a horizontally mounted motor outside of the boiler, the two elements being on a common base. The Aetna burner is designated by the diameter of the atomizing disc, which varies from 8 in. to 18 in., the twelve sizes providing for various capacities between 500 sq. ft. of steam radiation and 12,000 sq. ft. of steam radiation with the 16-in. size, while the 18-in. size is rated at 300 boiler H.P.



Aetna

NoKol

The NoKol burner for many years has been the product of the American NoKol Co., Chicago, and the 1928 model is practically the same as that marketed last



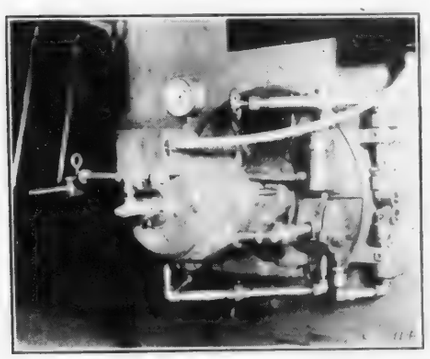
NoKol

year. These burners are available in nine sizes rated to provide for any capacity up to 12,000 sq. ft. of steam radiation. Atomization is accomplished in a Venturi tube, and the burner is rated on the basis of the diameter of the combustion pot, the smallest being 4 in. and the largest 20 in. An elaborate schedule of motor combinations makes it possible to procure standard NoKol burners for all of the standard voltages and many of the "freak" frequencies still used in some parts of the world.

Ray

The Ray burner has been manufactured by the W. S. Ray Manufacturing Co., San Francisco, Calif., for the past 14 years, during which time over 35,000 burners have been installed. It is designed to burn the heaviest grades of oil available for domestic purposes. Fully automatic burners are made in sizes to provide for heating loads up to 14,000 sq. ft. of steam radiation. Ignition is by electric spark or gas pilot.

The Ray burner utilizes for atomiza-



Ray

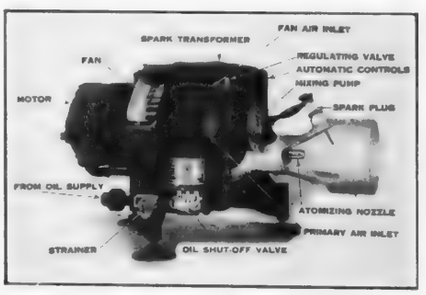
tion a cup attached to the end of a horizontal hollow rotating shaft. Mounted on this same shaft is a blower fan and motor armature of a totally enclosed motor. This entire unit rotates on ball bearings which are sealed in a lubricating oil bath. The oil fuel which is delivered to the cup by a pump is forced around the casing of the enclosed motor at low pressure and this circulation cools the motor, and slightly warms the oil. The oil then is forced through the control valves, which have large openings, through a tube in the motor shaft to the inside of the rotating cup, and is delivered there without pressure.

Air for combustion is forced at low pressure through a nozzle surrounding the rotating cup. This nozzle is equipped with vanes which direct the air blast in the opposite direction to the rotation of the cup, materially assisting in breaking up the oil and mixing it with air. All sizes are similar in general characteristics.

Timken

Simultaneously with the announcement that the Timken-Detroit Company has taken over the Socony-Arrow burner business and will continue to market the Timken-Arrow oil burner on a national basis, comes the announcement of a new model produced by this company known as the Model 20 Timken. Both of these burners are manufactured by the Timken-Detroit Co., 100 Clark Ave., Detroit.

The Arrow oil burner has not materially been changed during the last two or three years, and the Timken organization will continue its sale for heating loads between 750 and 1500 sq. ft. of steam radiation. The new Model 20 Timken is designed to provide for con-



Timken

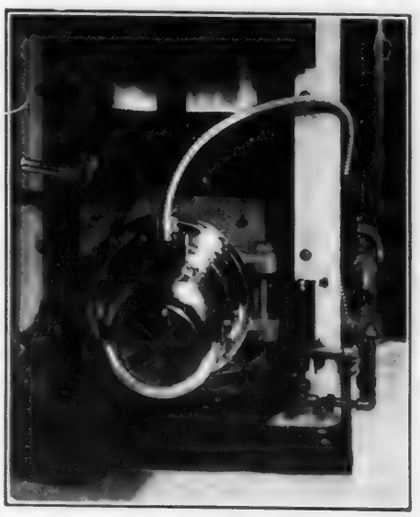
ditions where the heating load is less than 750 sq. ft. The new burner is built in a single unit, and consists essentially of a direct-driven Sirocco-type fan and an emulsifying pump into which air and oil are metered. The resulting frothy mixture is delivered through an atomizing nozzle, and ignition is accomplished by an electric spark. The split-phase motor is 1/6 H. P. at 1750 R.P.M., and drives a small pump located inside of the fan housing. It also drives a small rotary pump which is connected to the motor shaft by a universal joint. These are the only moving parts. Primary air and oil are fed to the mixing pump, each through a metering device, six orifices being used for the air, and a slotted stem for the oil. The rotor of the mixing pump is of the six-bladed type revolving 10,500 times per minute, churning the oil and air into a foamy mixture. The atomizing nozzle is conically tapered at the front end, and the smallest opening is ⅛ in. in diameter. The emulsified oil passes through a slotted plug just behind the nozzle, giving to it a spiral motion as it leaves the orifice of the nozzle. The spark plug is located directly under the nozzle and the spark is in operation for only about five seconds during the starting cycle. As a result the consumption of current for starting is practically negligible. The atomized oil is ignited inside the combustion tube, which projects in front of the nozzle, the secondary air passing around the flame within the tube is heated, thus assuring clean combustion as soon as the burner starts. Because of this design the burner is not dependent upon hot refractories. Convectional room thermostatic control is provided with interlocking safety devices to protect the boiler or furnace. A magnetic oil valve prevents the flow of oil when the motor is not in operation.

Silent Automatic

The Silent Automatic burner is manufactured by the Silent Automatic Corp., Detroit. It is made in one size and is designed to take care of practically every size and type of domestic heating plant up to 2000 sq. ft. of steam radiation. A simple regulating device which equalizes the ratio of air and oil in various quantities, depending on the size of the home to be heated, makes possible this range of adaptability. Silent Automatic is particularly adaptable to hot air, because of its unusual quietness in operation. Silent Automatic is a rotary-type atomizing burner. It is listed to burn 36°-40° A.P.I. oil, and is fully automatic in operation. Oil is prepared for combustion by a combination of mechanical atomization and heat vaporization. Ignition is either by an expansion gas pilot or an intermittent electric pilot. Removal of grates is the only change necessary for installation in heating boilers.

Johnson

Johnson oil burners have been manufacted for nearly quarter of a century by the S. T. Johnson Co., Oakland, Cal. This company produces a line ranging from the Johnson Junior, which is designed for homes where the heating load does not exceed 750 sq. ft. of steam radi-



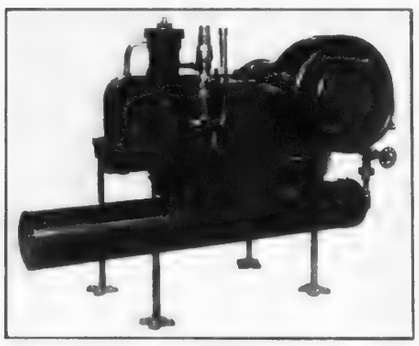
Johnson

ation, to burners capable of handling 500 lbs of oil per hour and providing heat for a 20,000 sq. ft. steam boiler. The essentials of the different burners remain the same, each succeeding size being merely an enlargement of the smaller unit. The one exception is the Johnson Junior, the new name given to the unit originally brought out as the "Cub." This unit has been specially designed for domestic requirements and of course is fully automatic in operation. The standard line of Johnson burners is available either in full automatic or manual control.

Quiet May

The Quiet May automatic oil burner is manufactured by the May Oil Burner Corp., Baltimore, Md. It is manufactured in three types, as follows:

Type A has a capacity up to 600 sq. ft. of steam radiation and, in addition to its home heating service, it also provides an excellent means of heating domestic hot water. It has capacity for raising 224 gals. per hr., 100°. It is listed as standard by the Underwriters to burn 28° A.P.I. oil or Pacific Coast diesel oil with



Quiet May Type L

gravity as low as 25°. Its fuel capacity is 2 gal. per hr.

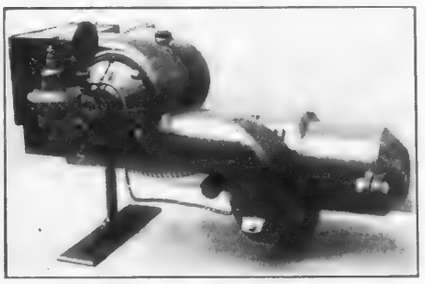
Despite the fact that it is the smallest of the Quiet May line, nothing in quality or workmanship has been sacrificed in its construction. It is similar in design and principle to the types L and C which have been on the market for several years.

Type L takes care of 2750 sq. ft. of steam radiation and has a domestic hot-water heating capacity of 840 gal. per hr. It has a flexible fuel range of 2 gal. to 7½ gal. per hr.

Type C is the largest unit, and is capable of taking care of 10,000 sq. ft. of steam radiation. It is provided with a boiler control and combustion safety for completely automatic operation.

Electrol

The Electrol burner is manufactured by Electrol, Inc. of Missouri, St. Louis. It is built in three models with ratings from 500 ft. to 8000 ft. for steam radiation. Electric ignition is a feature of Electrol burners and is the only type used.



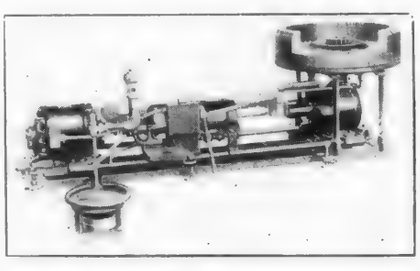
Electrol

Properly to burn oil at 28° gravity for which the Electrol is listed, it is necessary that complete atomization be secured. This is accomplished by forcing oil under pressure through a specially-designed spray nozzle. The nozzle on each model is the only part which varies according to load requirements. Oil pressure is varied by means of a specially constructed pressure-regulated valve incorporated in the pump unit. The pump is directly driven by the motor by means of a fibre coupling. It serves the double purpose of pumping oil from the supply tank and maintaining proper pressure for the desired degree of atomization. The pump is of the rotary gear type, having one driven gear and one idling gear—self-sealing. No auxiliary pumps or motors are required, regardless of the location of the tank. From the pump the oil goes through a specially constructed diaphragm valve, which prevents the oil from flowing by gravity from the pump and pressure-regulating valve, through the nozzle and into the combustion chamber. Also it immediately shuts off the oil at the nozzle tip to prevent dripping when the motor stops and the pressure drops on the pump. The atomized oil automatically is mixed with the correct amount of air for proper combustion, and ignited by an electric spark.

The new model TJ, which is rated at 500 sq. ft. of steam radiation, is ideally suited for smaller homes and for domestic hot-water heating. Model T is rated at 3000 sq. ft. of radiation, and model TD at 8000 sq. ft.

Hardinge

The Hardinge oil burner is manufactured by Hardinge Brothers, Inc., Chicago. In this burner atomization is accomplished through the medium of a chalice-shaped atomizer head, vertically mounted approximately at grate level.

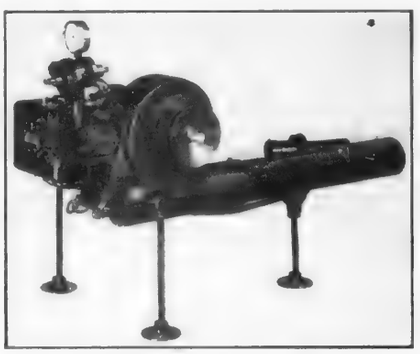


Hardinge

This atomizer head is mounted on ball bearings held in the base casting which extends out of the ash pit. On the outer end is mounted the driving motor and the mechanism for controlling the functioning of the burner. Substantially no changes have been made in this model for the last two or three years. The burner is manufactured in two models, and the full range of maximum capacities is accomplished by changing the diameter of the atomizer. This varies in ½-in. steps, between 3 in. and 7 in., the larger sizes being 8-in., 9-in., and 10-in. diameters. The burners are operated by motors ranging from ¼ H.P. for smaller sizes to 1½ H.P. for the largest size. They are rated to produce heat for boilers of 500 sq. ft. of steam radiation up to those capable of supplying 25,000 sq. ft. of steam radiation.

Kleen-Heet

Kleen-Heet burners are manufactured by the Winslow Boiler & Engineering Co., 844 Rush St., Chicago. They are built in three distinctive types. The model known as the "GJ" burner is available in four sizes covering a range up to 1200 sq. ft. of steam radiation.



Kleen-Heet Type 800

This boiler uses a regulated Bunsen-type gas pilot.

Type 800 Kleen-Heet burners are made in two sizes to take care of 800 sq. ft. to 6800 sq. ft. of steam radiation. These burners utilize electric ignition, and are equipped with the Minneapolis protectostat. Each burner is a complete unit, with only the thermostat, boiler control and a square D entrance switch separate from the burner assembly. Type 800 burners are designed for 28°-30° A.P.I. oil. A distinctive feature is the Winslow nozzle assembly, in which ten tips and ten stems allow 100 different nozzle assemblies, so that the proper flame can be produced regardless of the length or width of the combustion chamber.

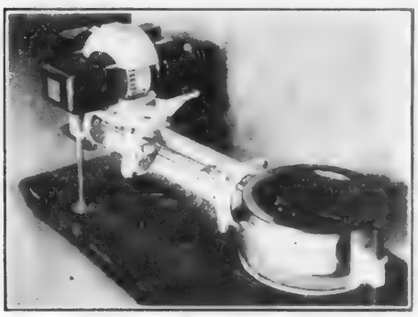
ABC

The ABC oil burner is manufactured by the Automatic Boiler Corp., 312 N. May St., Chicago. It has a maximum capacity of 3000 sq. ft. of steam radiation and equivalent hot water radiation.

The burner is installed entirely within the fire box of the boiler with everything out of sight. A 1/12 H.P. motor running at 10,000 R.P.M. draws oil up through a tapered hole in the motor shaft to the atomizer cup through centrifugal action. The oil is atomized from the edge of the cup and ignited with an electric spark, a combination gas-electric ignitor, or a magnetic gas ignitor. This device consists of a small constantly-burning gas pilot fed through a by-pass. When the motor starts the main gas line is opened by a magnetic valve and a large jet of flame is shot through the combustion chamber. Within a few seconds after ignition is accomplished the gas pilot dies down to a small flame fed by the by-pass.

Baker

The Baker automatic oil burner is manufactured by the Baker Steam Motor Car & Mfg. Co., Pueblo, Colo. One model is built in three sizes. The distinctive feature of the Baker burner is the double-plot arrangement which provides for preheating the air before it comes in contact with the flame. The



Baker

air is brought around and under the pot and introduced diametrically opposite to the spray of oil, each jet impinging on the other, at the same time the fresh air circulating around the pot cools the pot, thus retarding erosion by heat.

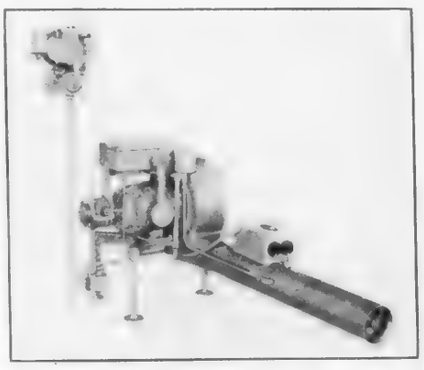
The Baker burner is equipped with Minneapolis controls and is fully automatic; is listed as standard by the Underwriters to handle Eastern oil of 32°-40° gravity, or 27° gravity Pacific Coast oil. The No. 10 size is rated for 800 sq. ft. of steam radiation, No. 20 for 1500 sq. ft. of steam radiation, and the No. 20-Special burns sufficient fuel to provide 4000 sq. ft. of steam radiation.

Gulf

The Gulf Burner is manufactured by the Gulf Oil Burner Co., 1627 Chestnut St., Philadelphia, Pa.

All styles and sizes are essentially the same with the exception of construction details.

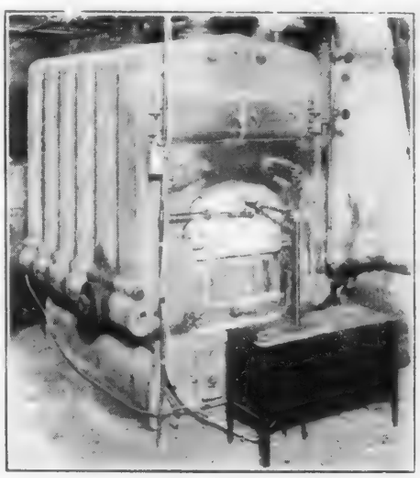
There are four sizes, all of which are provided with electric or gas ignition. The No. 1, No. 2, and No. 3 burners externally are the same size, but No. 5 is proportionately larger and operated by a 1 h.p. motor instead of a ¼ h.p. motor used on the other three sizes.



Hart

Hart

The Hart oil burner is manufactured by Preferred Oil Burners, Inc., Peoria, Ill. The burner consists of a small electric motor on the shaft of which is mounted a blower and rotor of an emulsifying pump. This single rotating unit is carried on oil-immersed bearings. The pump on the burner is connected to a mixing valve through a vacuum chamber. The vacuum chamber is tight to the oil-storage tank. The vacuum of the pump is exerted on this chamber and the oil is therefore lifted to this point, where ball float stops off a small quantity of oil to be burned. This oil with a definite amount of air is fed to the pump where it is beaten into an emulsion, and the emulsion is then forced out through a spiral channel and to the knife-edged nozzle tip at low pressure. Combustion air is provided by a Sirocco-type blower and delivered through an air spiral around the nozzle tip. Ignition, in the electro-gas and the straight gas-electric types, is obtained through a high-tension transformer. The electrodes of the straight electric ignition burner are set so that when in firing position they are just in the top of the oil-air stream. When ignition is accomplished the electrodes fall back out of position and into the clean air stream, preventing sooting and erosion. Preferred burners are made in a variety of



Gulf

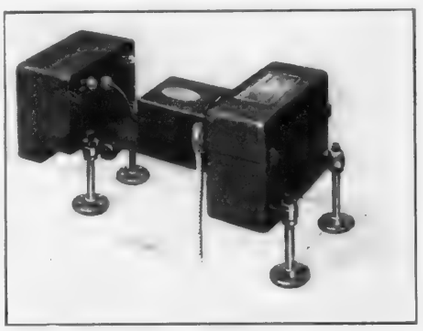
sizes capable of handling from 400 sq. ft. to 3200 sq. ft. of direct steam radiation.

Caloroil

The Caloroil burner is manufactured by the Caloroil Corp., New York. This burner has gone through the usual process of development, from which has emerged the 1928 model known as the "Model O Series 5." Atomization in this burner is accomplished by what is commonly called the "dressing-table atomizer" method. Oil, maintained at a fixed level in a sump, is drawn up through a vertical tube by virtue of a blast of air directed across the upper end of the tube, and atomized into the air stream.

The new model follows the general design of its predecessor, but has been refined to eliminate the relatively few causes for service found in the last model, and has at the same time new controlling devices for the oil supply and ignition that eliminates several parts previously used.

One of the distinctive features of Caloroil is that it is made in two separate



Caloroil

units. The atomizing and vaporizing unit is placed entirely outside of the boiler, usually at the ashpit door, and the motor and compressor unit is placed in any desirable position regardless of the location of the boiler. The atomizing and vaporizing unit consists of a base with the burner head located at one end, and the oil chamber and controlling devices at the other. The burner head is installed flush with the ashpit opening and bricked in.

Air is supplied by a ¼ to ½ H.P. motor driving a slow-speed rotary air compressor by silent reinforced link, or composition rubber-fabric endless belt. The compressor is automatically sealed and lubricated with lubricating oil contained in the base of the unit. Between the motor and compressor is an oil strainer to separate any lubricating oil from the air, and the air passes on through the air nozzle. This unit is noiseless in operation and the only attention necessary is to keep sufficient oil in the oil reservoir at the base. The oil nozzle has the smallest hole in the oil line—approximately ⅛ in. in diameter. The air nozzle is located just above and behind the oil nozzle, and the two are set permanently at the factory.

A characteristic feature of this burner

is the fact that one atomizer and vaporizing unit can use either one, two, or three sets of oil and air nozzles, each set handling approximately 22½ lbs. of oil per hour at 5 lbs. air pressure. Where three nozzles are used they are placed at definitely defined angles so that the three flames will enter the combustion chamber in a fane shape. The nozzle blocks are interchangeable and a dealer merely buys a number of atomizing and vaporizing units and several different-sized blocks containing from one to three sets of nozzles.

An outstanding feature is the oil-supply control, actuated by the air pressure developed by the compressor expanding a metal bellows. This open the oil valve, allowing oil to flow from the pump to the oil chamber under the atomizing tube. The oil level is maintained by a float in the chamber, establishing the oil level a definite distance below the orifice of the oil nozzle.

With this set-up no oil can flow from the oil pump to the atomizing unit unless the compressor unit is in operation. The motor and compressor unit cannot be in operation unless the thermostat calls for heat, and all parts of the apparatus are functioning properly.

This new Caloroil burner is equipped for electric-gas ignition, a constant gas-pilot ignition, and also full electric ignition. Where the last is used the electrode is behind the atomizing nozzle and not in the path of the oil; consequently there is no tendency to corrode. The spark grounds on the tip of the oil nozzle and practically is blown into the path of the atomized oil by the air from the air nozzle.

Minneapolis protective devices are used, including a thermostat, boiler control, protectorelay, and protectostat. The last operates on radiant energy from the flame and is placed in such a position in the front of the boiler that its opening is pointed directly at the core of the flame. In case ignition or oil supply should fail, it automatically cuts out the motor driving the compressor unit, thereby shutting down the burner.

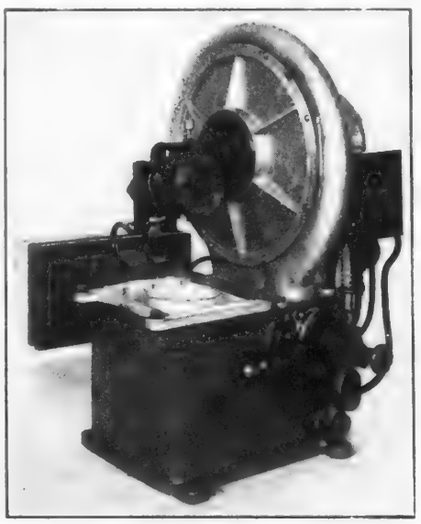
Special attention has been given in the design of this burner to the installation requirements, and they have been materially simplified. There are only two connections to make, one for oil and one for air, unless the electric-gas or gas ignition is used, and in that case three connections. This burner is listed to burn 28° A.P.I. oil, or lighter, using straight electric ignition, electric-gas ignition, or straight gas ignition.

Petro

The Petro domestic oil burner is one of the products of the Petroleum Heat & Power Co., 511 Fifth Ave., New York. It is made in four sizes, Models D-0, D-1, D-2, and D-3, providing for a range in capacity from ¾ gal. of fuel oil per hour to 42 gals. per hour. The four units are identical in general design, and constructional features.

The Petro is a mechnical draft oil burner of the air-driven turbine type. All parts are assembled on a cast-iron base and are mechanically and electrically interlocked to provide the safety attained. The motor, which is mounted on the fan housing, is designed and built to rigid specifications. This unit ranges in size from ⅛ H.P. for the smallest unit to 1 H.P. for the largest machine.

A multivane, centrifugal-type fan is mounted on the motor shaft. This unit is constructed of aluminum, is dynamically balanced, and supplies all of the air required for combustion. The air is divided into two parts designated as primary and secondary air. The primary air impinges on the blades of the turbine wheel, which rotates the atomizing cup, and in addition supplies part of the air required for combustion. Secondary air is adjustable as to quantity and this differential in the quantity of air admitted to the combustion chamber permits of the proper regulation of the air-oil



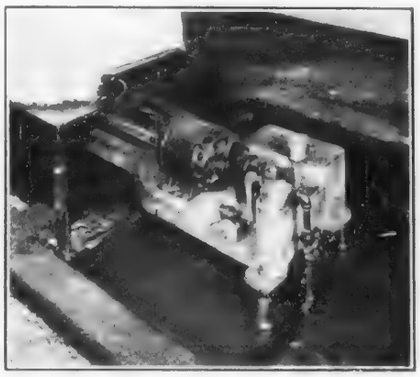
Petro

ration over the complete capacity range of the burner.

The oil pump which delivers the oil from the storage tank to the float chamber is mounted on the burner and may be either worm-driven or direct-connected by means of a coupling to the motor shaft. This unit is of the gear type, contained in a bronze housing.

The gun, which is the atomizing unit, consists of a machined steel barrel, cast-iron body, fuel-oil tube, lubricating oil mechanism, and bronze turbine assembly with annular ball bearings. Oil is forced from the float chamber through the yoke valve and fuel-oil tube to the atomizing cup by air from the fan, which builds up a few ounces of static pressure in the float chamber. This oil is delivered through the fuel distributor to the inner surface of the atomizing cup, where it is atomized and thoroughly mixed with the air required for combustion as it leaves the outer periphery of the cup. The control system embodies the standard Honeywell motor switch, combustion safety control, boiler limiting device, and thermostat.

The burners are listed as standard by the Underwriters' Laboratories for fuel oils not heavier than 24° A.P.I.



Marr Model "G"

Marr

The Marr oil heat machine, manufactured by the Marr Oil Heat Machine Corp., Minneapolis, is made in three sizes, briefly described as follows:

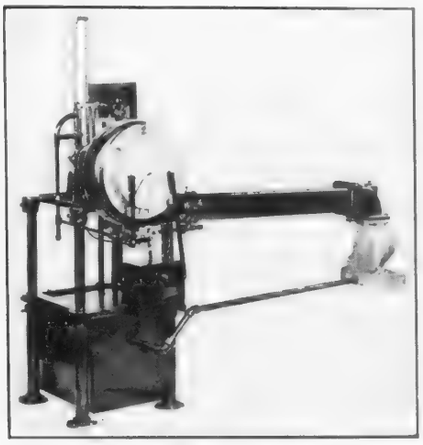
Model E is the vertical rotary atomizing type with the open-top cup-shaped atomizer. It is a complete unit including suction pump, automatic oil shut-off, Honeywell program control with thermal and float-ball safety devices. Fuel used is 20° A.P.I. with rated capacity up to 10,000 sq. ft. of steam radiation.

Model G is the same type. It is designed for gravity feed and includes optional high or low voltage control with float-ball safety device. Fuel used is 20° A.P.I. with rated capacity up to 2000 sq. ft. of hot-water radiation.

Model H is a radical step forward in oil heating mechanism. There is but one moving part. Instead of combustion chamber or open fire-box, it employs a mixing chamber which is installed in the furnace where the oil is converted into oil vapor and mixed with air before any attempt is made to burn it. There is no fire in this mixing chamber. Oil is not sprayed or pumped into the furnace. The oil-gas burns with a bright, clean, silent fire and there is no more noise or vibration in the motor mechanism than is produced by a small residence fan. A float chamber is employed to maintain a constant level of oil and the lowest overflow point in the mixing chamber is above the float chamber, hence there is no possibility of flooding the furnace. Fuel used is 36° A.P.I., with rated capacity up to 1250 sq. ft. of hot-water radiation. High or low voltage control is optional.

McIlvaine

The McIlvaine oil burner is manufactured by the McIlvaine Burner Corp., 749 Custer Ave., Evanston, Ill. The 1928 burner, designated as Type A, consists of a motor, pump, fan, and controller unit, made in one size, with six sizes of nickel-chromium alloy combustion chambers. These are numbered, and provide for capacities in square feet of steam radiation ranging from 600 to 2400.



McIlvaine

Continuous operation on the "high-low" principle is a characteristic of the McIlvaine burner. The change of flame size is made gradually to meet the varying demand for heat, by means of the McIlvaine automatic flame controller, which simultaneously controls the air and oil at low, high, and five intermediate flames. This functioning is obtained by a room thermostat, by boiler pressure, hot water temperature, or by means of a remote manual control. On low flame there is produced, in any of the combustion chambers, a small flame for little cold snaps in spring or fall. With the burner operating on high, ample heat is developed for the coldest weather.

Oil feeds by gravity from an elevated basement tank or automatic pumping unit through the combination float and safety shut-off valve, the centrifugal pump, and the control valve to the combustion chamber, where it is vaporized by contact with the hot metal. No gas pilot or electric ignition is required. At the beginning of the heating season the combustion chamber is preheated for about 10 minutes by means of a gas or oil torch. The oil feed and electric current are then turned on so that a flame burns continuously throughout the season. The motor consumes from 40 to 80 watts, depending upon the combustion chamber size and the size of the flame. The combustion-chamber air tube assembly is inserted through the firing door. The grates are covered with a sheet of asbestos paper and one course of firebrick laid on loosely. The inspection door, brick, and asbestos cement fill the remainder of the fire door opening.

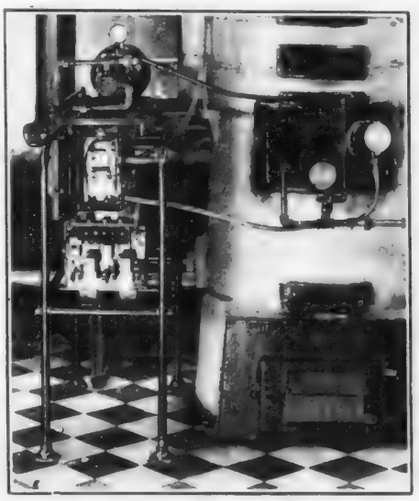
Combustion

The Combustion burner is manufactured by the Combustion Fuel Oil Burner Co., Milwaukee. It is built in seven sizes, rated to provide heat for 500 sq. ft. of steam radiation to 20,000 sq. ft. All sizes are of the nozzle atomizing type, the oil being pumped to the nozzle, where it is atomized with compressed air at pressures varying from 2 lbs. to 6 lbs., the air being furnished by a rotary-type compressor. This burner has been manufactured for a number of years with only minor changes suggested from time to time by study of service records. Combustion burners are listed by the Underwriters and are provided with both gas and electric ignition, with either fully automatic or manual control. All sizes are rated to burn oil of 24° A.P.I. gravity.

Pascoe

The Pascoe oil burner is manufactured by Wm. H. Pascoe Co., Inc., 1314 Belden Ave., Chicago. This burner is made in four sizes, and capacities may be had for any requirements up to 10,000 sq. ft. of steam radiation. Combinations of different motor sizes make it very flexible in this regard.

The burner is divided into three units. One element draws oil from the tank, emulsifies it with air and delivers it to the burner. The burner is composed of a straight-tube nozzle, by-pass, and diaphragm, and a gas pilot-light or electric



Pascoe

ignition. Minneapolis controls, consisting of thermostat, boiler heat control, and protectostat, are used. The emulsifying device consists of a rotating pump with a cam core and sliding blade, with an aspirator valve at the top. The rotor beats the air and oil into an emulsion and forces it through a flexible connecting tube to the burner nozzle, where it is ignited by the expanding gas pilot light. Combustion is controlled by regulating the flow of oil to the rotor and by adjusting the air intake of the aspirator. The grates of the boiler are not removed, but are covered with a layer of factory brick. The burner is designed to operate on fuels of 28° A.P.I. or higher.

Sword

A burner characterized by the use of a distinctive method of securing quiet combustion is manufactured by Sword & Kimber Co., Philadelphia. This is a pot-type burner in which inert gases taken from the combustion chamber are introduced into the bottom of the firepot, there to mingle with the incoming oil gas which thus is thoroughly mixed with inert gases prior to the admission of air for combustion. The result is a delayed or slow combustion that scarcely can be heard outside of the burner. The Sword oil gun or nozzle is a specialized development of this organization and provides for proper atomization without danger from clogging. The burner is built in only one size, designed to provide for heating load less than 1500 sq. ft. of steam radiation.

Wayne

A burner that in appearance is radically different from its contemporaries is manufactured by the Wayne Co., Fort Wayne, Ind. It is characterized mainly by the use of an oversized vertically-mounted electric motor driving a set of gear oil-pumps and a fan. The motor is rated at exceptionally low speed in the various sizes, averaging 1200 R.P.M. Oil pumps are mounted in a vertical line below the motor, each connected to the nozzle through a flexible coupling. This whole assembly is installed at some little distance before the firedoor, the atomizing nozzle being carried in a holder bolted to the ashpit door, receiving its supply of air and oil through flexible connections. The design of this burner has not changed materially since its introduction several years ago. It is built in three blower sizes and eight nozzle sizes, making combinations capable of handling from 400 sq. ft. to 7500 sq. ft. of steam radiation.

Sundstrand

The Sundstrand oil heat generator, manufactured by the Sundstrand Engineering Co., Rockford, Ill., is a radical departure from almost every other conventional type of oil burner on the market and remains, in 1928, in the same form in which it has been marketed for several years. It employs a combustion pot, but instead of introducing oil gas to the fire through the bottom or sides of the box, the oil is sprayed in atomized form, from a point just within the fire door, down into the box, which thus is a target for the oil spray. Air for combustion is introduced through the sides of the fire box, and, moving upward by virtue of its velocity, forms a cushion for the atomized oil. Just enough air is blown through the nozzle to atomize the oil. Ignition is initiated just a little below the nozzle, and progressive combustion marks the progress of the oil gas down to the firebox, where the secondary air is encountered, and here combustion is practically completed. A single-phase repulsion ¼ H.P. motor drives a low-pressure fan furnishing air for combustion, and, through a worm-gear drive, actuates a four-cylinder air compressor supplying air at 10 lbs. to 15 lbs. pressure, to the atomizer nozzle. This burner is designed for loads not exceeding 2000 sq. ft. of steam radiation.

Editor's Note: Photographs and descriptions of several burners, which did not arrive in time to be included in this presentation, will appear in the April issue.

National District Heating Association

District Heating Activities During 1927

From the report of Hal C. Kimbrough, published in the bulletin of the National District Heating Association, the following data are taken, relative to expansion and extension in the field during the past year:

Installation of underground steam mains in the past year exceeded perhaps in total feet of mains, customers' connections and investment, any previous year within the history of this association, now in its twentieth year.

A survey of mains installed during the year brings out the fact that there is a marked tendency to carry pressure at and above 100 lbs., which has much to do with the greater demand for steam service by a more varied classification of customers. This medium pressure (100 lbs.) to high pressure (375 lbs.) has provided steam service for every requirement in large office buildings; the lack of which has been, in previous years, a considerable deterrent; buildings which required not only steam for heating but superheat for cooking, sterilizing, and in many instances, steam power, now are being cared for.

The outstanding new construction programs in the past year were Akron, O.; Austin, Minn., and Philadelphia. In Cedar Rapids, Iowa, the heating system which has been operating more than 30 years, was extended to care for a very large hotel, the Roosevelt, a new Masonic Temple and a beautiful Memorial Building.

In Kansas City, 2380 ft. of 18-in. and 1400 ft. of 14-in. pipe has been put in. This installation may be described as "moving the plant" away from the business center of Kansas City to the river plant of the street railways company. The connected load of the Kansas City Plant amounts to 120,000,000 cu. ft. A further statement is made, of which this company has reason to be proud, that steam has not been off the mains for a period of five minutes since January, 1917.

After an agitation on the subject covering several years, Kalamazoo, Mich., has at last secured, through a special election, a franchise for a central heating system. Previous to the election, plans and contracts had been prepared and the latter signed conditional upon the passing of the franchise. By virtue of this forethought, work was begun by the American District Steam Company three days after the approval of the ordinance by the electorate and the required approval by the officials. The constructional program was completed within four months after the beginning of the work. The mains have been installed for 100 lbs. pressure and the rates of service range from $1.50 per 1000 lbs. to 80c per 1000 lbs., based on consumption. An interesting development is found in the installation of an underground heating system in Akron, O., the company starting the heating season with the very considerable and unusual first-year load of 4,500,000 cu. ft. of space to be heated. A dual rate is in force with a demand charge based on installed radiation and payable in eight equal monthly payments, and consumption charges of 70c per 1000 lbs. for the first 500,000 lbs. and 55c per 1000 lbs. for all in excess of this amount.

At Austin, Minn., a little city of 12,000 population, it was found impossible for legal reasons to operate a heating department in connection with the efficiently operated municipal water and light plants, so a separate organization was formulated to bring about this desired end.

This plant operates at a pressure of 10 to 15 lbs. and serves only the business section of the city, with an aggregate load of 70,000 ft. of radiation and 120 customers.

In London, Ontario, a small plant has been remodeled and is distributing steam at 125 lbs. pressure over the entire business section of the city. The fifty customers have increased to nearly 200 and practically the entire capacity of the plant is now absorbed. Nearly a mile of high-pressure piping has been installed during the past year and a considerable extension will be made to the boiler plant and distribution system during 1928.

In Philadelphia, the Philadelphia Electric Company has decided to enter the field of steam service supply in a considerable area of the business district generally east of Broad Street. A site was selected at Ninth and Willow Streets on which has been erected a modern plant for steam production having three boilers with a capacity of 225,000 lbs. of steam per hour, with a lay-out providing for 100% increase in the boiler capacity. Steam will be distributed with an initial pressure of 250 lbs. and 500° F. About half a mile of 18-in. pipe has been laid connecting to the present 175 lb. system which supplies Gimbel Brothers, Litt Brothers, and other large customers.

Information Wanted for Use in Compiling Piping Code

The National District Heating Association, co-operating with other interested organizations, is engaged in compiling a code to cover pressure piping applied to district heating. The term "pressure piping" has been interpreted to include all piping carrying fluids at pressures over 15 lbs. gauge. Sabin Crocker is the representative of the N. D. H. A. on this committee. The purpose of the code is to provide a sane foundation for such regulatory legislation as may be enacted by various states from time to time, to cover the design and erection of piping systems. There appears to be a definite movement on foot to regulate, by law, systems as boiler design is now regulated. It was felt that if such regulation was to be enacted the code upon which it is based should be prepared by piping experts and should be uniform throughout the country.

Such a code doubtless would cover such matters as the weight of pipe and fittings required for various working pressures; the degree to which welding would be permitted; the method of providing for expansion and drainage; and similar matters pertaining to safe design and installation. The association would, of course, have an opportunity to express itself concerning the exact draft of this section of the code. The other question is of interest to those engaged in district heating by hot water. The question is whether a section of the code should be drawn up to cover the distribution of hot water for heating and the radiators and piping in buildings. It was felt by certain members of the committee that the pressures carried on distribution mains might create dangerous conditions. The committee desires to obtain from each district heating company engaged in hot water heating, and from others who may have valuable data, replies to the following questions:

1. What is the maximum pressure carried in any part of the hot-water distribution system?
2. What is the maximum pressure carried in the piping in any consumer's building?
3. Is any means taken to prevent the full main pressure from being applied to the piping inside the customer's building?
4. Do you favor the preparation of a section of the National code for pressure piping to cover the subject of hot water heating?

Any contributions of information on this subject should be forwarded to D. L. Gaskill, secretary of the N. D. H. A., Greenville, O.

District Heating School at Purdue

Co-operation between the National District Heating Association and Purdue University has resulted in the establishment of a short course in district heating, to be held May 21-26, 1928 and 1929.

There will be three separate divisions; one an elementary division in which the following subjects will be taught:

1. Principles of heat and properties of steam.
2. Computation of heat losses from buildings.

3. Design of heating systems.
4. Flow of steam in pipes.
5. Heat loss from underground pipes.

An advanced course is intended for men who have had considerable experience, or who have attended the first division school. In this course the following subjects will be taught:

1. Meters and rates.
2. Operation of steam heating systems.
3. Reducing valves, traps and other appliances.
4. Distribution system design.
5. Underground construction.
6. Estimating steam consumption of buildings.

In addition to these courses it has been suggested that a round table course be held which would consist of more or less formal discussion presented by senior members but with students in the other two sections privileged to attend and listen to the discussion. In this round table course the following subjects will be considered:

1. Sales policies and system extensions.
2. Rates.
3. Boiler plant design.
4. Heat utilization.
5. Franchises, permits and rights-of-way.

The school will be under the direction of Dean A. A. Potter, of the School of Engineering, and will be directly handled by Prof. C. H. B. Hotchkiss, who has just returned from a trip covering the middle western and eastern parts of the United States, where district heating is in vogue.

The following statement from the report of J. H. Walker, chairman of the Educational Committee of the N. D. H. A., is significant of the breadth of minds of those back of this project: "The attendance will not be limited to members of this association or to employees of member companies. We are performing a service for the entire heating industry, and the more people who can profit by it, the better. The financial arrangement agreed upon was that the university contribute the time of its faculty members and the use of their buildings and equipment at a charge of $10 per student. This is merely a nominal charge and does not cover the cost to the university, but the university authorities are entirely satisfied and do not wish a higher tuition." Mr. Walker also reported that correspondence indicates that the course will be attended not only by those who are in minor positions in the industry but by some of the leading executives. It is expected that this beginning will form a definite prescribed course, which probably will be held at Purdue every year.

Miniature Building for Fire-Fighting Tests

TO demonstrate to the San Francisco firemen the correct and incorrect methods of ventilating a burning building, Fire Chief Thomas R. Murphy, of the San Francisco Fire Department, recently built a miniature five-story building and showed by means of actual fires started on the various floors just how a fire will spread under various conditions.

The building is a class "A" structure of concrete and steel. It is equipped with five rows of double doors, designed to represent windows and doors, which are mounted on hinges and are equipped with thick panes of glass to permit the firemen to see the conditions inside the building. The various floors of the miniature building are connected with an elevator shaft and stairways just as in an ordinary factory building.

As a result of the tests, Fire Chief Murphy has demonstrated that a burning building should not be ventilated until firemen are ready to advance with lines of hose from every vantage point, because the fire will travel through every opening to the floors above. The purpose of ventilating a burning building is to clear away smoke and gas so that firemen can get to the seat of the fire.

Fig. 1 shows the right way to ventilate a building. The firemen have the hose ready to advance the minute the miniature door is opened.

Fig. 2 shows the wrong way. Here the doors on all five floors have been opened when only one line of hose is ready.

Figs. 1 and 2. Using Miniature Buildings to Determine Best Methods of Controlling Fires in Large Buildings

Large Field for Small Ventilating Equipment

Utilization of the attics of homes that heretofore have been but storage places for odds and ends, and entirely uninhabitable because of atmospheric conditions, has become a possibility through the application of small ventilating fans.

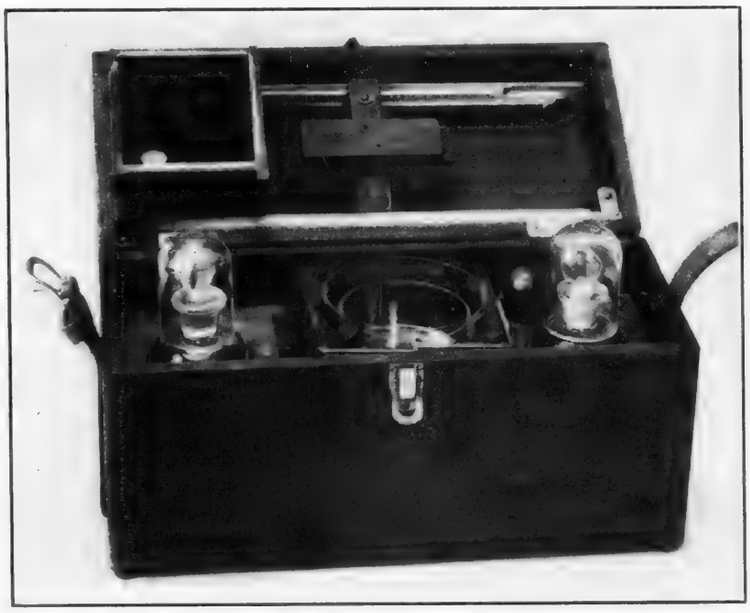
Until recently the attic was considered intolerable because it was either too hot or too cold—according to the season—dust accumulated and the air was stale. Mothers who hesitated to send their children out to play in bad weather or risk the traffic of the streets, banned them from the attic because of these conditions. But the attic can be made livable for play or sleeping purposes, particularly during the summer months, simply by placing a comparatively inexpensive ventilating fan in the gable end of the attic. The fan is so arranged that it will exhaust the hot air during the daytime and at night it is turned around to drive outside air into the attic space. The result is that the children not only have a play room but may sleep there during the warm seasons.

It has been suggested that houses should be constructed so that each would have two or more flues leading from the basement to the attic. One of these flues could be used to take the air from the attic to the cellar by means of a small fan, while the other could be utilized for taking the cold, damper air from the cellar to the attic. In this case, a fan would be needed in each flue, but the method would be particularly suitable near the sea coast where the air is usually damp during the summer time.

A Unique Ventilation Indicator

A substitute for the smoke bomb in connection with tests of air movement was described by Prof. F. L. Fairbanks at the recent annual meeting of the American Society of Heating and Ventilating Engineers in New York. Prof. Fairbanks's apparatus provides for the spontaneous generation of ammonium chloride vapor.

The apparatus, like many things that are of value, is very simple. In the form used for ventilation work, it consists of two concentric dishes. The bottom of the larger dish is covered to a depth of about ⅛ in. with ammonium hydroxide, the bottom of the smaller dish is covered to the same depth with hydrochloric acid. The smaller dish is placed within the larger dish and the vapors from the two chemicals immediately combine to form the familiar ammonium chloride salt.



Ventilation Indicator Developed by Professor Fairbanks to Detect and Trace Air Movements

Through the co-operation of Eimer & Amend in this work, the complete apparatus in suitable carrying case with compartments for sling psychrometer and anemometer is available so as to provide complete equipment for air movement studies.

Chicago Furnace Installation Must Conform to Code

Largely through the instrumentality of the Greater Chicago Warm-Air Heating Association and Local Union No. 73, there has been adopted, in Chicago, a standards furnace ordinance together with provisions for its enforcement.

This ordinance very closely approaches the code of the National Warm Air Heating and Ventilating Association, the main difference being in the clauses relating to elements which it was necessary to alter in order to meet union conditions in Chicago.

All furnace installations in the future, in the city of Chicago, must be made by contractors who are registered in the city hall and who pay a license fee of $50 per year. A contractor installing furnaces not in accordance with the code is liable to a penalty, and even may lose his license, in which event, he would not again be permitted to install furnaces in this territory. It is anticipated that the operation of this ordinance will result in a very high grade of furnace installation in Chicago, which condition, of course, is a very desirable one.

The ordinance makes provision for the issuance of permits for each furnace installed, renewed or repaired for the sum of $5, but no heating permits are required for minor repair work. The ordinance provides for the salaries of a chief inspector and ten inspectors, all of whom must be competent journeymen sheet-metal workers. These inspectors are required to pass upon installations when work has progressed to the point where stacks to upper floors and heads for all side-wall registers have been installed, boots connected thereto, and the lining of all cold-air return ducts completed. Upon finding that the work complies in all respects with the terms of this ordinance, the inspector then affixes to each register head and lining of all cold-air return ducts a certificate stating that the work complies with the ordinance.

Final inspection of the plant is made after the whole is connected up and ready to operate, before any fire has been started.

The ordinance makes it unlawful for any person to lath over, plaster or cover up any warm-air heating work before it has been inspected and the certificate attached. The inspectors have the right and authority to remove or have removed such lath, plaster or other coverings for the purpose of carrying out inspection. All firms engaged in the business of installing gravity warm-air heating plants and appurtenances are required to register and to file with the city collector an indemnifying bond in the penal sum of $2000 and the registration fee of $50 per annum.

The ordinance provides a penalty of a fine of not less than $50 or more than $200 for violation of any of the provisions of this ordinance, or for the installation of a gravity warm-air heating plant by any firm or corporation not registered.

The operation of this ordinance will be watched with a great deal of interest, as it is maintained by those who have sponsored it that standards of layouts and installations will be greatly improved through its operation.

Westchester Oil Burner Association Holds Annual Meeting

At the annual meeting of the Westchester Oil Burner Association, held at the Huguenot Arms, New Rochelle, N. Y., February 1, the following officers were elected for the ensuing year:

President, W. H. Brower, Sr. (A. B. C. Burner), New Rochelle; vice-president, Leo J. Murray (Ray Oil Burner), Mount Vernon; treasurer, L. L. Halle (May-Westchester Oil Burner Co.), New Rochelle (re-elected); secretary, A. L. Kimball (Socony Burner Corp.), New Rochelle (re-elected).

To work with these officers, the following members were elected to round out the executive committee:

J. S. Donnolly (Silent Automatic Sales Corp.), White Plains; A. W. Price, of A. H. Karl, Inc. (Kleen-Heet), Mount Vernon; Wm. B. Lippoth (Electrol), New Rochelle.

The association was formed a year ago by a number of firms in this county most prominent in the sale, installation, and servicing of oil heating equipment. The organization has as its object the protection of its members and the good name of the industry, the interchange of technical data and trade information, the furtherance of good-fellowship between members, and the promotion of an even wider interest on the part of the public in the comforts of house heating with oil.

BUILDING UNDERGROUND STEAM MAINS TO GIVE LASTING TROUBLE-FREE SERVICE is the title of an illustrated brochure issued by the Underground Steam Construction Co., 75 Pitts St., Boston, Mass. Practically all of this brochure is devoted to photographic illustrations of construction difficulties overcome in work by this organization.

United States Radiator Purchases Pacific Steel Boiler Corporation

An offer of the United States Radiator Corporation, of Detroit, Mich., to purchase the stock of the Pacific Steel Boiler Corporation of Illinois, Waukegan, Ill., on the basis of $14.90 a share, it is announced, has been approved by the stockholders of the Pacific company. In accordance with this vote, the property of the Pacific Steel Boiler Corporation has been taken over by the United States Radiator Corporation and the Pacific company will be liquidated. Stockholders of the Pacific company will receive cash or stock and debentures in the United States Radiator Corporation in exchange for their holdings. The amount involved in the transaction is in excess of $3,000,000.

To take care of the financing of the deal the United States Radiator Corporation announces an issue of $3,500,000 5% sinking-fund debenture bonds. After purchasing the assets of the Pacific Steel Corporation the balance of the proceeds from the sale of these debentures will be used as an addition to the cash resources of the United States Radiator Corporation.

United States Radiator Corporation is a consolidation of six well-established boiler and radiator companies, and now is one of the largest producers of cast-iron low-pressure heating boilers and radiators in the world. Its products, which are marketed under the trade-name of "Capitol" boilers and "Capitol" radiators, are used for steam and water heating systems in all types of buildings.

Construction Started on New Testing Laboratory for American Gas Association

So successful has been the operation of the Testing Laboratory of the American Gas Association in the temporary quarters established in Cleveland, that it became necessary to provide for greatly enlarged facilities. A short time ago the association authorized the construction of a new building to cost $150,000 and to be located within a stone's throw of the present laboratory. Construction on the new building has been started, and the laboratory will be dedicated and put into service at the earliest possible moment.

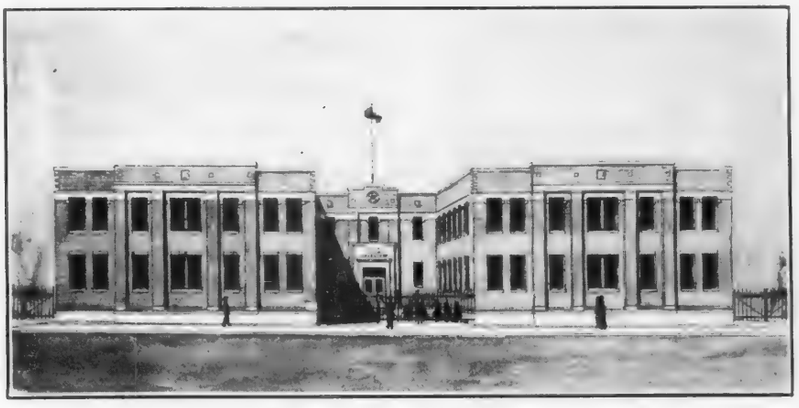
P. E. Fansler Wins Honorable Mention in Editorial Contest

In a series of contests conducted by the Associated Business Papers, Inc., which included one for the best article or series of articles or news reports, judged broadly on the basis of timeliness, accuracy, thoroughness, originality, clearness of expression and usefulness, the jury of awards was unanimous in awarding one of the four honorable mentions of the sixty-nine papers submitted, to P. E. Fansler, associate editor of THE HEATING AND VENTILATING MAGAZINE, for his article on "Some Thoughts on the Combustion of Oil," published in THE HEATING AND VENTILATING MAGAZINE for April, 1927.

This, as well as the other awards in the contest, will be announced formally at the Washington meeting of the National Conference of Business Paper Editors, March 12. At the same time certificates of honorable mention will be presented.

New Ratings for Oriole Radiators

Effective February 1, new ratings were announced for Oriole radiators, in conformance with the schedule adopted by radiator manufacturers, and announced in THE HEATING AND VENTILATING MAGAZINE for February. These changes affect only three, five, and seven-tube elements, and bring these ratings into general agreement with those of other manufacturers. Oriole radiators are manufactured by The Republic Radiator Company, Baltimore, Md.



New Testing Laboratory, American Gas Association, Cleveland

Death of Thomas Barwick

Thomas Barwick, a charter member of the American Society of Heating and Ventilating Engineers and one of the pioneers of the industry, died February 15, at his home in Englewood, N. J., after a short illness. His death was due to heart trouble. He was 71 years old.

For many years Mr. Barwick conducted a consulting engineering business of his own in New York. Since about 1917 he had been consulting engineer for Buchman & Kahn, architects, of New York. It was during this connection that Mr. Barwick did some of his most important work in heating and ventilating design.

For years he had been a familiar figure at meetings of the A.S.H. & V.E. and the New York Chapter of the society, and during the discussions could usually be counted upon to contribute something of value from his long and varied experience.

JAMES H. LINNANE, heating and plumbing contractor of Des Moines, Iowa, died at his home, 3703 Grand Avenue, January 25, at the age of 66. Mr. Linnane was a member of the Wallace & Linnane Company, which was organized more than 40 years ago.

PHILIP MUELLER, first vice-presdent of the Mueller Co., Decatur, Ill., and superintendent and works manager, died at his home January 23. Mr. Mueller was 69 years old, and at any early age joined his father and brother, Henry, in the plumbing business, becoming a partner in 1886. Through his long shop experience Mr. Mueller became a master plumber and was a member and a regular attendant at the conventions of the National Association of Master Plumbers.

THOMAS E. HOYE, president and treasurer of the Thomas E. Hoye Heating Co., Milwaukee, Wis., died at the Columbia Hospital in that city, February 2. From 1904 to 1906 Mr. Hoye was commissioner of public works in Milwaukee.

CHARLES KROESCHELL, one of the founders of the Kroeschell Bros.' Co., Chicago, Ill., died at his home, January 29, at the age of 80. Mr. Kroeschell had lived in this city for the past 66 years.

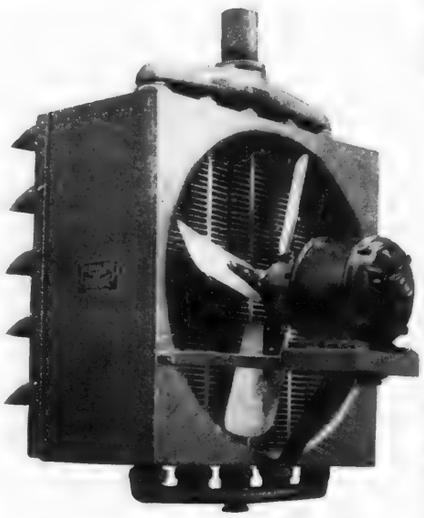
WILLIAM MCCOACH, of Philadelphia, past treasurer of the National Association of Master Plumbers, died February 12, at the age of 75. Mr. McCoach entered the plumbing business when he was 16 years old, starting as an apprentice with John E. Hunter & Company. In 1877 he went into business under the name of McCoach & West, and in 1878 he took over the business. For the past 46 years Mr. McCoach had been active in the association.

JOSEPH A. SPROULS, well known as a heating and plumbing contractor in New Jersey, died at his home in Jersey City, February 5. Mr. Sprouls was 58 years old and had been in business for over 35 years. He was president of the New Jersey State Association of Master Plumbers during 1916-17, and later a director of the national association.

New Apparatus and Appliances

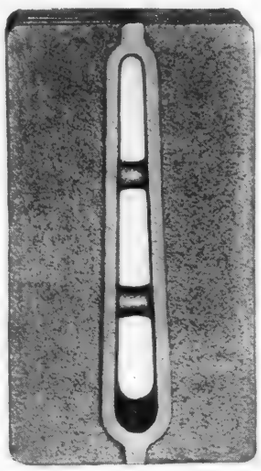
A Unit Cast Extended-Surface Heating Unit

Following a long period of exhaustive research in aluminum-alloy casting, the Thermal Units Company, a division of the Mechanical Mfg. Co., Chicago, has placed on the market an extended-surface thermal unit in which each element is an integral casting of aluminum alloy. Each radiator section consists of a rectangular core with well-rounded corners with inlet and outlet connections cast integral. The outside shape of the core is streamlined to minimize air resistance through the radiator element, permitting the handling of a large volume of air at high velocity and eliminating objectionable eddy currents. These units are designed to operate on any pressure from atmospheric to 150-lb. gauge. Made

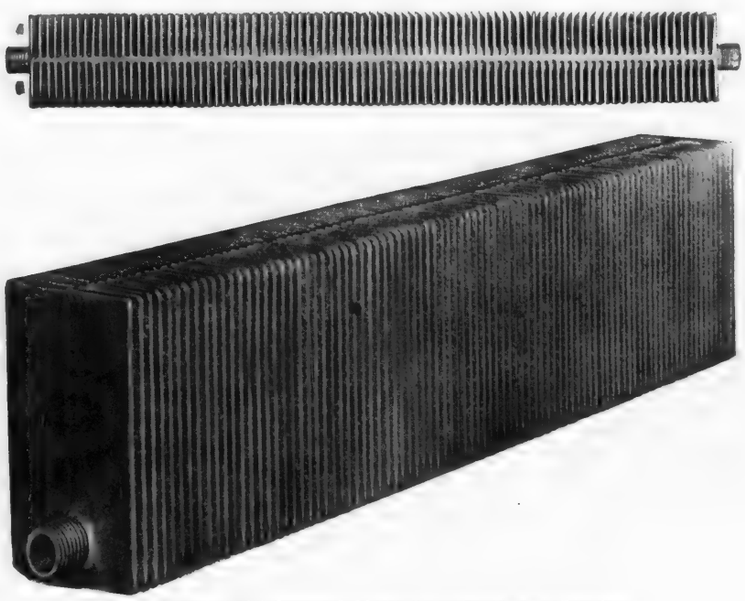


Assembled Thermal Unit

up in the form of a unit heater and known as the Thermal Unit, these elements offer many advantages for rapid heating of large spaces. The standard model 20 Thermal Unit is rated to deliver 2600 c.f.m. with 1/6-H.P. motor operating at 1135 R.P.M.



Section Through Thermal Unit Radiator Showing Streamlined Core



Two Views of Thermal Unit Cast Radiator Section

New Sarco Self-Adjusting Steam Trap

Incorporating several refinements in design, the Sarco self-adjusting steam trap No. 9 is designed for both high and low pressures, is factory adjusted, and works on widely fluctuating pressures as well as on a fixed pressure. Operating on the "balanced pressure" principle, the pressure within the thermostatic element balances against the steam pressure, making the trap self-adjusting through the entire range from 0 lbs. to 100 lbs. The Sarco helical bellows, made from seamless bronze tubing, is used as a thermostatic element. The trap is manufactured by the Sarco Co., Inc., 183 Madison Ave., New York.

Grinnell Announces the Thermolier

A unit heater known as the Thermolier is announced by the Grinnell Co., Providence, R. I., for more than 70 years a leader in industrial heating work. These new units, known as Model 800, weigh approximately 200 lbs., and are said to be equivalent to more than 2 tons of cast-iron radiation. Each unit is a little more than 2 ft. square and is designed to provide heat for 500 to 5000 sq. ft. of floor space, depending upon conditions. Units may be under individual or group control, either manual or automatic, through room temperature. Seamless copper tubes with separate brass

Grinnell Light-Weight Unit Heater

fins make up the heating element. The U-tube elements are rolled into cast-iron headers, and are so designed as to provide for expansion and contraction, and to drain. The motor is rated at ¼ H.P. heavy duty, oversize, and moisture-proof, and normally operates at 1150 R.P.M. The housing is of heavy copper, insuring long life, and the frame is of pressed steel. Louvers are rigid, but easily adjustable, to deflect the warm-air current downward at the proper angle. The cooling leg is integral with the radiator and no outside cooling leg is necessary. Design of the radiator is such that perfect drainage is secured through one ¾-in. thermostatic return-line valve attached directly to the unit. The Thermolier is tested to 125 lbs. steam pressure and with a steam supply at 5 lbs. gauge, and inlet temperature of 40° F. is rated to deliver 230,000 B.T.U. per hour. With a room temperature at the inlet of 70° the rating is reduced to 175,000 B.T.U. per hour.

Marsh Competitive Radiator Valve

A cone-disc valve built to the same standards of workmanship and finish as the packless and modulated lines, has been placed on the market by the Marsh Valve Co., Dunkirk, N. Y. The cone-disc valve fits against a bevel seat which is low in the valve body and has no rim raised above the bottom of the valve. It is therefore practically impossible for grit to accumulate and cause leakage when the valve is supposed to be closed. The valve has a large-size packing chamber with gland follower, and is designed as a high-class fitting to enter the competitive field.

Victor Screen Ventilator

An interesting refinement of the conventional deflector used where so-called open-window ventilation is practiced has been designed and produced by the Victor Screen Ventilator Co., 130 Washington St., Reading, Pa. This device combines the advantages of the ordinary

Victor Screen Ventilator

glass deflector with those of a high-grade copper fly screen. The screened section is covered with louvres which can be controlled by turning a knob at the end of the ventilator. It can be furnished to match any standard color or kind of woodwork.

Bristol Type "B-K" Valve

An electric motor-operated valve for steam, water and compressed air is announced by the Bristol Co., Waterbury, Conn. This differs from the earlier types in several features, the principal being its rugged construction, high ratio between motor and valve speeds, and the provision for keeping the high temperatures of steam lines away from the motor and operating mechanism.

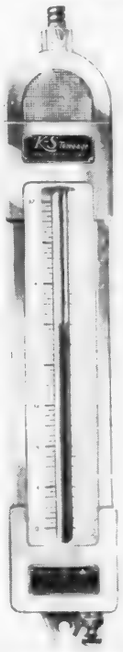
A heavy globe-valve body of standard design is employed, and the operating unit is supported clear of it on a rigid bracket of such design as to eliminate the possibility of lost motion between the gear train and the valve stem. The valve is operated by a cam acting on a follower directly in the line of the stem and tending to force it to the open position. The speed reduction from the motor to the cam shaft is accomplished by a train of cut spur-gears. All gearing is contained and totally enclosed within a cast-metal casing.

The motor is of a standard make, and is carried on one end of the gear box by a waterproof mounting. Power consumption of the motor is only about 25 watts, and the time of opening or closing the valve approximates 12 sec. In a readily accessible compartment is mounted a limit switch whose function is to clear the motor circuit when the operation of opening or closing the valve is completed. This switch is actuated by a small cam carried on the main camshaft, and thus is positively interlocked with the valve. The switch parts are constructed of heavy phosphor bronze strip with massive tungsten contacts; the whole is mounted as a unit within a molded bakelite casing. All wiring between the switch and the motor is enclosed in flexible armored conduit.

This valve is not of the "floating" type, but comes to rest either tightly closed or wide open. Thus the motor is not required to reverse, but when started continues to run until the cam has made half a revolution, closing or opening the valve as the case may be, when the circuit is automatically cleared by the action of the limit switch.

The type "B-K" valve lends itself particularly to installation on the steam lines to any service where there is required the automatic or remote control of temperature or humidity by means of steam. It also is applicable to the control of water supply for heating or cooling purposes, or to the control of water level in storage tanks for processes, or for fire protection. The valve is available in all sizes from ½ in. to 2½ in., and for pressures from 150 lbs. in the smaller sizes to 75 lbs. in the larger. The motor can be supplied for any of the standard voltages or frequencies.

Telegage For Oil Tanks



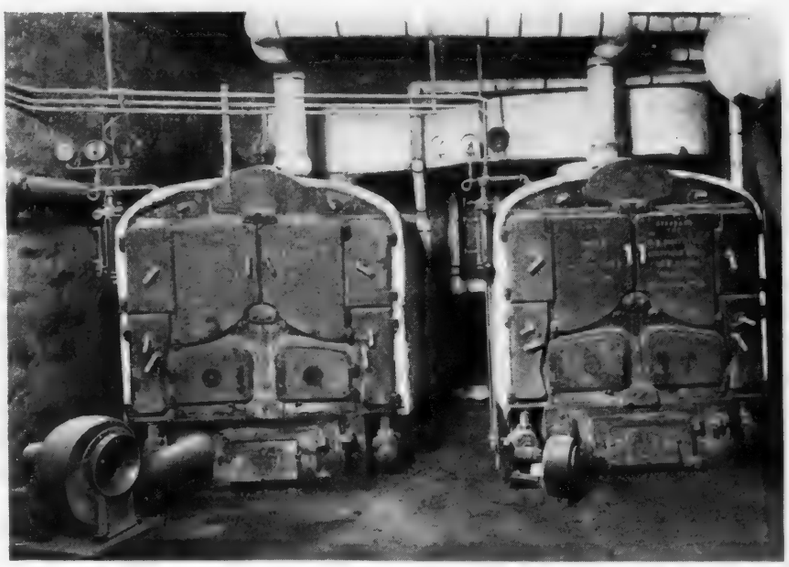
Telegage Indicates Contents of Oil Tanks

K-S Telegage, designed to give readings of the contents of oil tanks, is manufactured by King-Seeley Corp., Ann Arbor, Mich. This firm has had many years' experience in the manufacture of tank gauges and, it is stated, has produced over 1,250,000 gauges, largely for automotive use.

The oil Telegage is a hydrostatic instrument, the indicator portion being installed indoors, the tank unit resting on the bottom of the tank, and the two being connected by a flexible metal conduit. The tank unit is easily adaptable to different types of tanks and the gauges can be supplied with dials calibrated to the maximum depth of tank in which each model will fit, with masks provided, permitting the dealer to set them for each installation.

Gifford System for Burning Small-Sized Coal

A combination of a motor-driven blower, operating under the control of a room thermostat, is manufactured by the Gifford Heat Control Systems, Inc., 1 Broadway, New York. This equipment is designed for use with domestic heating plants using the regular grates as supplied by the boiler manufacturer. The thermostat operates on the damper and air check, at the same time controlling the blower motor according to the demands for heat.



Two Boilers Equipped with Gifford System for Burning Small-Sized Coal

Teesdale Markets New Automatic Oil Pump

A new automatic oil pump with a capacity of 30 gal. per hour, designed for use with the Teesdale 50-gal. tank, has been brought out by the Teesdale Mfg. Co., Grand Rapids, Mich.

The pump is similar to the company's TU model, and is equipped with sleeve-bearing motor mounted above the pump, with its vertical shaft supported by a spring. This spring has a tension equal to the weight of the motor armature assembly; consequently the armature is so held in suspension that it does not ride on the lower bearing. One of the features of this unit is a provision to prevent the oil tank from going dry, there being always a reserve supply of 40 gal. of oil to tide the user over until his outside oil tank can be refilled. The tank size is 21 in. in diameter and 30 in. high, and the construction is of 16-gauge steel.

Raymond Weather Compensator

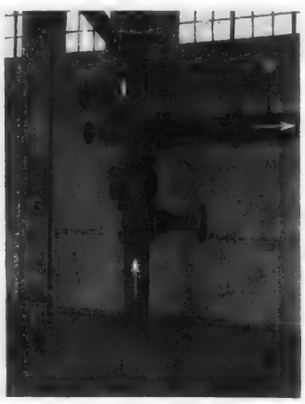
A control for heat regulating systems, operating in a manner similar to an aquastat in a water heating system, and with the limiting point changing automatically with the outdoor temperature, has been brought out by F. I. Raymond, 258 N. Keystone Ave., River Forest, Ill. The Raymond weather compensator, as it is known, is a regular contacting thermometer of the distance type, having two bulbs instead of one. One bulb is located outdoors and the other is placed in the boiler or clamped on the pipe.

Duplex Heat Control Device

When the sum of the outdoor and boiler temperatures reaches a fixed point, the instrument is designed to retard the fire, regardless of the room thermostat. When the outdoor and boiler temperatures fall to a second fixed point, the instrument returns the fire to room control. The fixed point represents the temperature required in the boiler for zero weather and, therefore, usually will be between 170° F. and 180° F. Thus, with a setting of 170°, the boiler temperature could rise to 170° in zero weather but only to 110° in 60° weather.

A Novel Flow Indicator

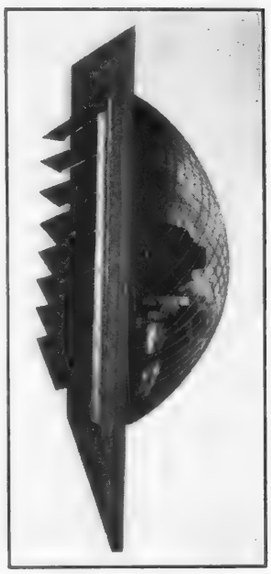
Designed for making visible the flow of liquid in a pipe, a flow indicator has been placed upon the market by Schutte & Koerting Co., Philadelphia, Pa. This device is a fitting somewhat resembling a tee, which is inserted in the line as would be a common fitting. The opening corresponding to the branch in a tee is closed with a screw fitting having a glass window through which flow in the pipe can be observed. Such a device installed in the discharge pipe from a steam trap shows whether the trap is operating properly, or if properly installed will show the condensate draining from closed feed-water heaters, evaporators, exhaust-steam lines, and similar equipment. These indicators can be furnished in sizes from 1½ in. to 3 in., inclusive.



Flow of Fluids in Pipe Is Visible Through This Device

Austin Oil Service Tank with Automatic Pump

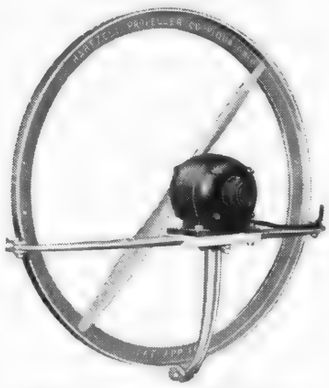
A 50-gal. oil-burner service tank in which a fixed level automatically is maintained, is manufactured by the Austin Welding Works, Chicago. The unit consists of a two-section tank, the lower portion holding 50 gal., and an upper container, in which a fixed level is held through the action of a small motor-driven pump, actuated by a 3-way Mercoid switch. The pump draws oil from the storage tank and insures a 50-gal. reserve whenever the storage tank is emptied.



Charavay Fan Unit with Shutter Closed and Guard in Place

Charavay Propeller Fans

Exhaust ventilating units are described in a folder issued by Hartzell Propeller Co., Piqua, O. This unit consists of a frame designed to be mounted on a metal shield, or otherwise, carrying a propeller-type fan driven by a suitable electric motor. The fans are built in various sizes from 40-in. to 36-in. diameter and are driven by motors ranging from 1/20 H.P. to 1 H.P. and rated to handle from 2000 to 18,000 C.F.M. of free air.



Charavay Propeller-Type Ventilating Fan

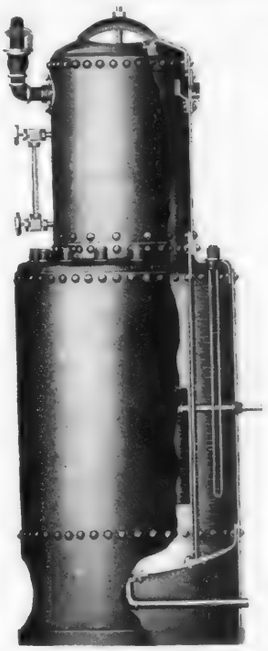
Enflo Diffusers

An article in the December issue, describing Enflo diffusers for use in theaters carried the erroneous impression that these diffusers must be installed at the ends of rows of seats. It should be noted that they can be installed under any part of a row. Introduction of air into the auditorium then is parallel to the rows and not directly on the feet of the occupants.

Bigelow Electric Steam Generator

Designed primarily to provide steam for process work or heating, where electricity can be had at low rate, an electric steam generator is announced by the Bigelow Co., New Haven, Conn. This boiler is built in 7 sizes, rating from 12 to 250 k.w.

As one boiler-horse-power is approximately 10 k.w. in heat equivalent, the horse-power rating of the generator can be obtained by dividing the kilowatt rating by 10. The efficiency of this electric generator approaches 100% as the only loss is that due to radiation and this can be largely eliminated by proper lagging.



Electricity "Fires" This Heating Boiler

A Fuel Value Computer

A novelty in the form of a chart for selecting and evaluating coals is known as the fuel value computer and is sold by the Coal Specialties Co., 50 Church St., New York. A circular which accompanies the computer gives directions for its use.

One of the problems which the computer will solve is that presented when a certain seller is offering coal at, say, $5.23 net ton delivered, and another is offering a coal of somewhat lower grade. Knowing all of the variable factors such as current price delivered at plant, moisture, volatile matter, fixed carbon, ash, sulphur and B.T.U. content, it is easy to determine from the chart the fuel cost in cents per million B.T.U. of each grade. Tables for converting prices per gross ton into prices per net ton are provided on the back of the computer.

The computer is made of heavy Pyralin and is printed in red and black. It measures 9⅜ in. x 11⅜ in. and is priced at $10.

Economizer for Oil-Burning Systems

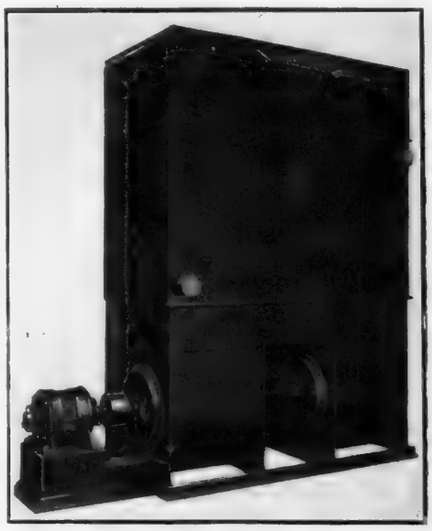
Under the name of the Meyers double-duty fuel saver, an economizer, designed for use with domestic oil-burning systems, and described as having a heating capacity as great as an additional 24-in. furnace, has been brought out by the Meyers Fuel Saver Co., Inc., Janesville, Wis. It is intended for use with any type of heating plant, steam, water or warm air. The unit is furnished in a size as high as an average furnace and 34 in. wide and 54 in. long. With the casing in place, the outside dimensions are 5 ft. 6 in. x 6 ft. 6 in. and 62 in. high. It is made as a separate unit and may readily be attached to the heater.

Buffalo Type "AA" Unit Heater

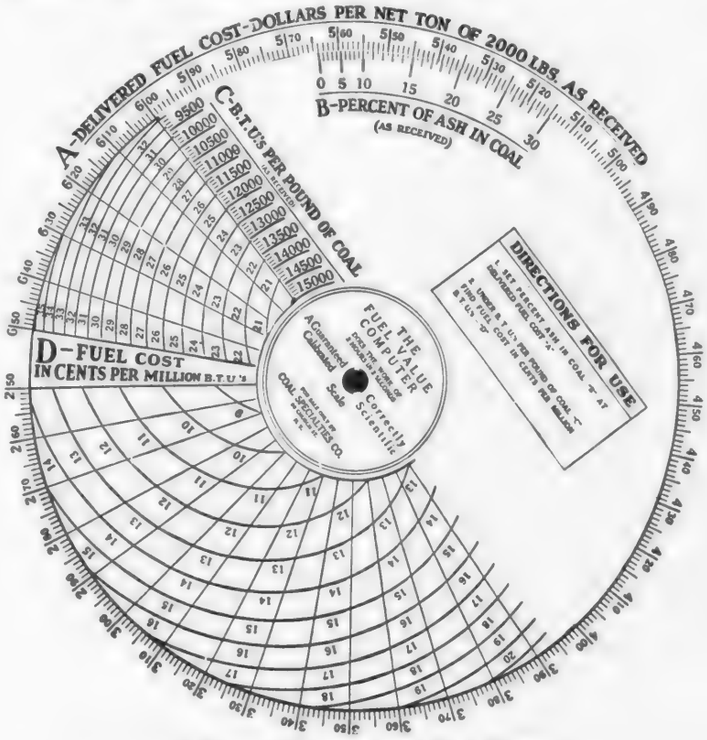
A floor-type high-pressure unit heater, designated as Type "AA," has been announced by the Buffalo Forge Co., Buffalo, N. Y.

These unit heaters are made in three sections. The lowest part consists of a pair of Buffalo Conoidal fans on a single shaft driven by an electric motor or pulley. These multi-blade fans give high efficiency and are quiet in operation. Above the fans are the heating coils, made up from ½-in. steel pipe, bent by special tools designed for this work. These pipe coils are assembled in staggered rows between two extra-heavy steel headers which project through the sides of the coil casings. One end of each header is flanged for connection to the supply or to the return steam line. The right and left-hand fittings used on the terminals of these pipe coils are handled with an ordinary "S" wrench and any coil can be removed for inspection in a few minutes. The entire unit is practically unbreakable, the headers being of 4½-in. extra-heavy steel pipe and the fittings for connecting the pipe to the headers are turned from solid steel.

Type "AA" unit heaters are made in 5 sizes, requiring from 1 H.P. to 7½ H.P. for operation.



Buffalo Type "AA" Unit Heater


A-DELIVERED FUEL COST-DOLLARS PER NET TON OF 2000 LBS. AS RECEIVED
B-PERCENT OF ASH IN COAL (AS RECEIVED)
C-B.T.U.S PER POUND OF COAL (AS RECEIVED)
D-FUEL COST IN CENTS PER MILLION B.T.U.'S
THE FUEL VALUE COMPUTER
DIRECTIONS FOR USE

A Graphic Computer of Fuel Values

New Trade Publications

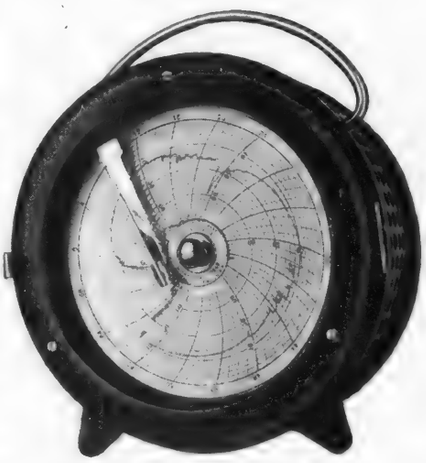
A BEAUTIFUL PIECE OF FURNITURE THAT HEATS is the title of a little folder distributed by the Quaker Mfg. Co., 215 North Michigan Ave., Chicago, describing the Quaker oil-burning heat-circulating cabinet. This consists of a steel combustion chamber enclosed in a rectangular steel cabinet finished to represent mahogany. The oil burner, as designed by James L. Breese, is of the atmospheric type and is incorporated in the combustion chamber. A tank holding a normal supply for a day is an integral part of the installation. This heater is one of the novel developments of the oil-burner field.

FISHER AUTOMATIC SPECIALTIES, including governors and regulating devices for pumps, reducing valves or pressure regulators for gas, air or steam, reducing valves for domestic or house service, strainers of many types, float valves and tank controlling devices, and other specialized equipment, are featured in a series of catalogs received in a loose-leaf cover, from The Fisher Governor Company, Marshalltown, Ia. For nearly half a century this organization has devoted its energies to the design and production of this class of apparatus, and the entire line is stamped with individuality. Remote-type liquid level-controllers and vacuum controllers also are featured in separate sections. This literature is well illustrated, the parts are accurately described and the tabular data cover all important dimensions and features. Size 8 in. x 10½ in. Pp. 120.

FROM THE FAR-AWAY PLACES OF THE OLD WORLD is the caption of an interesting circular issued by MacAndrews & Forbes Co., 200 Fifth Ave., New York. In it are described the sources of raw material, the processes of manufacture and the utilization of Maftex, a structural insulating board. This product is made from the roots of licorice plants brought from foreign countries to the United States. The long, tough fibres of the licorice root are shredded and treated, waterproofed, and felted, and the mass is passed through many presses and formed into a single-ply continuous sheet without laminations. This sheet is cut to standard sizes and the resultant product is strong and of high insulating value. The bulletin states that a series of booklets has been prepared presenting in detail all of the essential data on Maftex.

TORCHWELD WELDING AND CUTTING EQUIPMENT is described in a catalog issued by the Torchweld Equipment Co., 224 N. Carpenter St., Chicago. This company, after a long process of development, offers a complete line of portable and stationary models for oxy-acetylene welding and cutting, lead-welding, brazing, soldering, and decarbonizing. The catalog lists, describes and prices this line in complete units and in detailed parts. Size 4 in. x 9 in. Pp. 46.

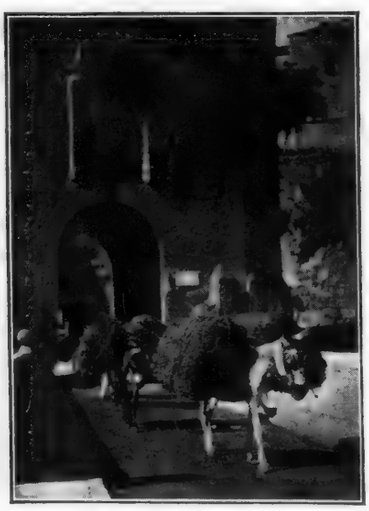
A NEW ERA IN VENTILATION is the caption of a circular issued by Sinclair Equipment Corp., 500 South Peoria St., Chicago. In it is featured a propeller fan with a distinctive type of blade, patterned, to a large degree, from the wing of a bird. It is stated that exceptionally high efficiency is obtained from this fan, largely because of the fact that it moves a solid shaft of air instead of having a core at the hub of the fan. The circular is illustrated with diagrams and drawings showing the principle of operation; also with a number of photographs showing Hi-Lo ventilating systems in operation.



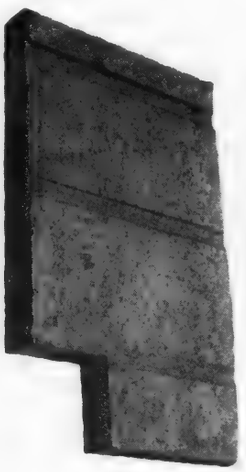
Bristol Atmospheric Recording Thermometer

BRISTOL'S RECORDING INSTRUMENTS IN THE POWER PLANT appears on the attractive cover of Bulletin 363, issued by the Bristol Company, Waterbury, Conn. This contains a complete outline of the functions of various types of Bristol instruments in power-plant use, together with information on the specifications of this equipment. An interesting feature is a four-page tabulated list of applications and instruments recommended for the power plant. This covers a wide range, including applications to boilers, turbines and engines, condensers, generators, Deisel engine plants, electric transmission and distribution and a section devoted to miscellaneous uses. Size 8½-in. x 11-in. Pp. 28.

REPRODUCTION PROCESSES is the title of a booklet prepared and distributed by the National Process Company, 218 West 40th St., New York. It is composed of a number of chapters, each devoted to a specific type of reproduction process, and the latter portion is devoted to a description of the Repro-Print method featured by this company. A copy of "Reproduction Problems" will be mailed upon request.

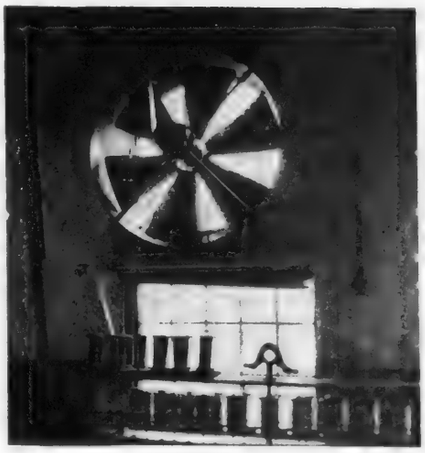


Mule-Train Bringing Licorice Roots Into Toledo, Spain, from the Tagus Valley



Maftex—an Insulating Material Made from Licorice Roots

Huge Warehouse Filled with Licorice Roots to Be Made into Maftex



Perkins Ventilating Fan in a Cotton Mill

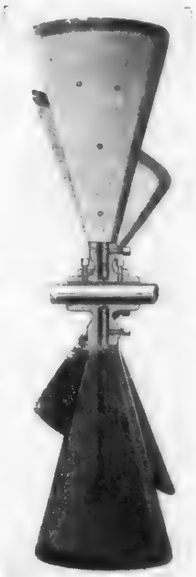
PERKINS VENTILATING FANS of heavy-duty type for specialized ventilation are described in Bulletin No. 10, issued by B. F. Perkins & Son, Inc., Holyoke, Mass. The fans are characterized by a number of novel features. The six radial blades of pressed steel are each fastened to a threaded steel stem which screws into a hexagonal hub with a tapped hole on each face. Set screws in the hub grip each of these rods above where the thread is cut and securely hold the blade at any desired angle. It is stated that any mechanic with a wrench and a protractor, in a very few moments, can set the blades to meet the specific conditions of the job. Ball-bearing end thrusts are used, and removable babbitt bushings in self-oiling journal boxes carry the shafts. These fans are made in many sizes, from 18-in. to 120-in. diameter.

THE WEIR BOOK OF FACTS has been prepared by the Meyer Furnace Co., Peoria, Ill., to broadcast the features of the line of welded steel furnaces manufactured by this company. The presentation is in excellent and convincing style, and illustrations bring out the salient features of design and construction. It also contains an illustration and description of a device for heating water for the domestic supply.

CAPITOL RADIATORS WITH STANDARDIZED RATINGS is the caption of a bulletin circulated by the United States Radiator Corp., Detroit, Mich. This bulletin contains tabulated ratings, in square feet of heating surface, for the complete line of Capitol 3, 4, 5, and 6-tube radiators; also for the 7-tube window radiator and the 4-tube wall radiator.

BROOMELL DIAPHRAGM THERMO RETURN TRAPS are described in a circular issued by the Vapor Heating Co., York, Pa. This trap is designed for vapor, vacuum, or low-pressure steam heating systems, and is guaranteed to remain closed at all points between 18-in. vacuum and 25-lb. steam pressure. The thermal member is constructed of a special metal developed after years of research, and the thermal liquid is inserted into it through a bronze stud under a partial vacuum, which makes it unnecessary to use solder on the edge of the thermal member. These traps are manufactured in three sizes designed to provide for radiation up to 500 sq. ft.

OIL HEATING—WHAT IT MEANS TO THE ARCHITECT is a well-told story presented in effective form by the Williams Oil-O-Matic Heating Corp., Bloomington, Ill. The keynote of this presentation is found in the first chapter entitled, "How Oil Heating Affects Plans and Construction Costs." Diagrams and sketches show how a large proportion of the volume of almost any basement can be converted into a usable portion of the home through the adoption of oil fuel. Several suggestive sketches show how play rooms for the children and billiard rooms can be incorporated in basement plans. A section is devoted to oil heating of commercial and industrial buildings, the presentation being designed to interest architects in space and other economies that can be secured when oil is burned. The latter portion of the booklet is given over to a description of the Oil-O-Matic burner, the several essential parts being shown photographically and well described in the text. In order that architects may appreciate the extent to which Oil-O-Matic has been presented to the general public, a page is devoted to the subject of national advertising of Oil-O-Matic in such magazines as the *Saturday Evening Post*, *Good Housekeeping*, *Collier's*, *Country Life in America*, *Literary Digest*, *The National Geographic Magazine*, and others. There is also presented a brief story of the Williams Institute of Research.



Detail of Perkins Fan Showing Adjustable Blades

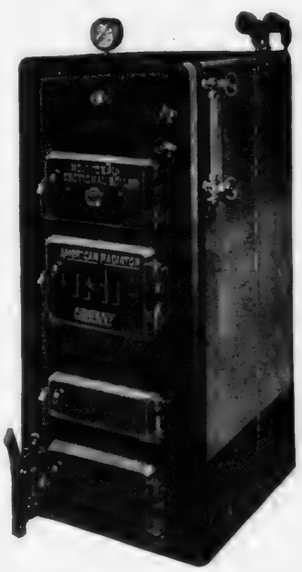
R. M. C. GAS BURNERS are featured in a circular issued by the Rotary Mfg. Co., Los Angeles, Cal. These burners are built up in units, combinations of which can be made to fit any particular boiler. Each burner unit produces small, fan-like flames, the gas issuing from slots in the burner casing. Each individual burner is designed with the axis of the jet of incoming gas at an angle with the plane of the fan-shaped flame. As the gas enters the burner, it draws in the proper proportion of air and impinges on the inside face of the mixing chamber, spreading out in a thin film, thereby securing an intimate mixture of the gas and air, prior to issuing from the slot. It is stated that the resulting combustion is exceptionally good and that unusually high combustion temperatures obtain. The literature names a number of schools, apartment houses, hotels, office buildings and churches in which the R. M. C. gas burner is used.

LET THE IRON FIREMAN SOLVE YOUR FUEL PROBLEMS is the title of a 4-page circular issued by the Iron Fireman Automatic Stoker Corp., 535 Fifth Ave., New York. This bulletin presents the results of typical evaporative tests made on a Bigelow horizontal return-tube boiler in the Briarcliff Lodge Hotel, Briarcliff Manor, N. Y. It is stated that over 6000 installations of the Iron Fireman automatic stokers have been made.

BUILDING TO SAVE OIL BURNER HEAT is the caption of a small folder issued by Armstrong Cork & Insulation Co., Pittsburgh. In this bulletin is told the story of the application of Armstrong's corkboard to both old and new homes. The text is a strong argument for the advantages of corkboard insulation in homes heated with oil burners.

STEAM HEATING TAKES ANOTHER LONG STEP FORWARD is the caption of the first of a series of advertisements appearing in the *Chicago Sunday Tribune*. The advertisement takes the form of a letter signed by C. A. Dunham, in which are outlined the fundamental principles of the Dunham subatmospheric system of steam heating.

NEW AMERICAN RADIATOR PRODUCTS is the caption of a bulletin published by the American Radiator Co., New York, in which is illustrated and described equipment recently placed on the market by this company. These include Red Jacket boilers, Corto radiators, Peerless wall radiators, Arcola heaters, Ideal water heaters, and Vecto heaters. A number of pages are devoted to a tabulation of dimensional and other statistical data on these products.



Ideal Red Jacket Boiler

SPUR AND HERRINGBONE GEAR PUMPS are described in Bulletin No. 17-A, issued by Schutte & Koerting Co., Philadelphia. These pumps find application in boiler installations where oil or water is to be handled, or for operating conditions for which pumping equipment of the piston, plunger or centrifugal types is not suitable.

The spur-gear pump is designed to handle fuel oil, lubricating oil or other thick or viscous liquids of a lubricating nature. The pump consists of a cycloidal-shaped housing containing two gears—the driving gear and the idler or driven gear. The driven gear is supported on a film of lubricant, and the external and internal pressures caused by the gear teeth closing in on trapped slugs of liquid are eliminated by a cushioning arrangement that insures easy operation and reduces wear to a minimum.

The pumping action is positive, the gear teeth carrying the liquid in slugs around the inner surface of the housing from the suction side to the discharge side. The gears and housing are designed with minimum clearance, and the slip at ends of teeth and over the tops of the gears is negligible. Oil is delivered at a uniform pressure without shock or vibration.

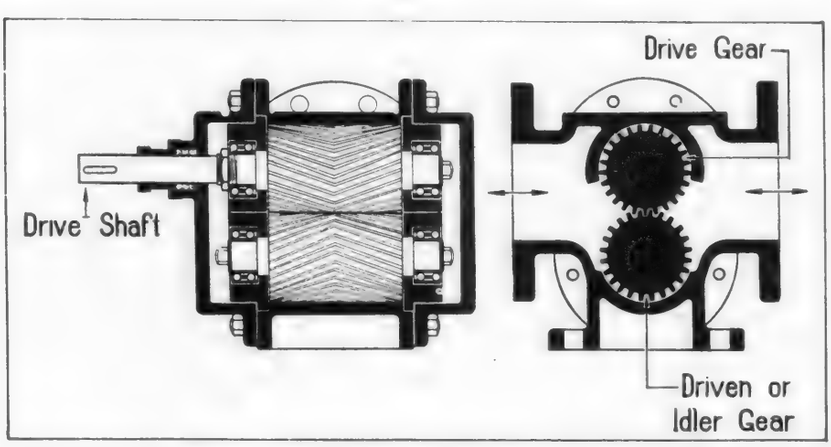
The spur-gear pump ordinarily is built with cast-iron body and steel gears. Front and rear bearings are made of cast iron, the drive end of the pump shaft being fitted with cotton graphited packing. Where service conditions indicate the use of special metals, the entire pump can be made of monel, steel or other materials. They are designed for low speeds not exceeding 600 R.P.M. and for pressures up to 300 lbs.

The catalog also describes a line of herringbone gear pumps, designed to operate at higher speeds than the spur gear pumps, and arranged to handle oil or water and other liquids of non-lubricating character. The spur gear pumps are rated to handle from 1 gal. per min. to 152 gal. per min., and the herringbone gear pumps have capacities from 2 gal. per min. to 194 gal. per min. at 50 lbs. head.

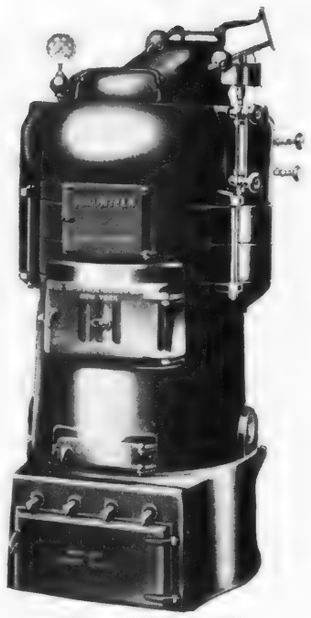
CIRCULAIR HEAT is described in a catalog issued by Circulair Heat, Inc., 215 Central Ave., Louisville, Ky. This well-illustrated booklet contains elaborate descriptions of the Circulair extended-surface heating unit, together with the different cabinets and housings in which it can be installed. Many excellent photographic reproductions afford a good idea of the manner in which Circulair can be used in connection with almost any style of interior decoration and finish. Curves are presented showing the capacities of various types of Circulair units in equivalent square feet of cast-iron direct radiation. Tables also are given showing B.T.U. transmitted under different conditions. Circulair was described in THE HEATING AND VENTILATING MAGAZINE for December 1927. Size 8½ in. by 11 in. Pp. 44.

THE MOST ECONOMICAL METHOD OF BURNING COAL is the title of Bulletin 979, published by the Detroit Stoker Co., General Motors Bldg., Detroit. This bulletin outlines the factors to be considered in selecting fuel-burning equipment, with a brief discussion of the several points. The various types of Detroit stokers are illustrated, including multiple-retort rear cleaning, for large boilers requiring high duty; double-retort side-cleaning stoker for medium boilers; single-retort stoker, side cleaning, for small to medium boilers of 100 to 300 H.P. each; the UniStoker, which is a modification of the single-retort side-cleaning stoker, having the motor and fan attached as a single independent unit; and industrial stokers for all services. The bulletin should be of special service to consulting engineers and executives considering power-plant extensions.

STERLCO-ROYS THERMOTROL is described in a circular issued by the Sterling Engineering Co., 1626 Holton St., Milwaukee. This device is a self-contained automatic temperature regulator operating on a radiator, without wall thermostats, air compressors or piping. It is designed to maintain room temperature at a fixed point, to be low in first cost, and to function without deterioration. Thermotrol is made in three sizes, ¾-in., 1-in., and 1½-in.



Schutte and Koerting Herringbone Gear Pump



Page "Volunteer" Steam Boiler

PAGE BOILERS are described in Catalog No. 54 just received from the Wm. H. Page Boiler Co., 200 Madison Ave., New York. In this catalog of conventional pocket-size, equipment manufactured by this company is pictured and described in detail and in assembly. Also there is featured a complete line of accessories and Corto radiators. Usual technical data are included. Size 4½ in. x 7 in. Pp. 104.

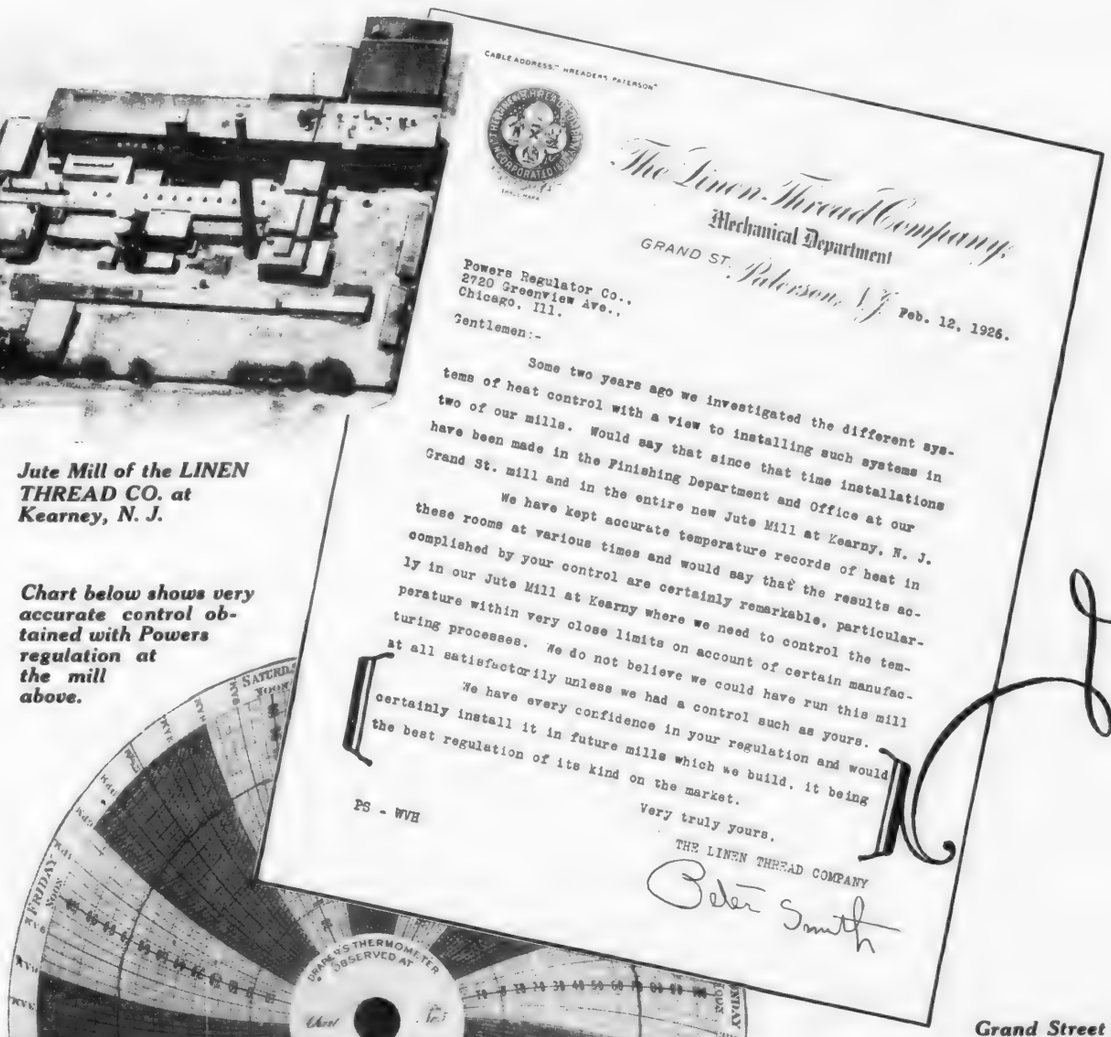
THE ADSCO ADVOCATE, edited and published by the American District Steam Company, North Tonawanda, N. Y., has for a leading article "Where Can District Heating be Applied?" This is an analysis of the factors entering into district heating and the various limitations that govern its practical use. As an example, it is stated that "The cost of a ten-mile distribution system in New York may easily be $5,000,000, while a similar ten-mile system to serve Columbus, O., may not cost over $750,000." The article is an excellent one for generally "selling" the idea of district heating. Another interesting article in this issue is entitled "District Heating as a By-Product of Industry," while a third tells the story of district heating for colleges and other building groups.

Correction

In an article describing the automatic horizontal self-cleaning air filter manufactured by the Midwest Air Filters, Inc., and appearing in this section in the February issue, was an unfortunate error. The story as dictated was as follows: "The resistance of the unit is stated to be 0.25 in. with continuous air flow when the filter is operated at specific capacity. In transcribing the "0" became a "4," and the error was not caught in proofreading. It is obvious that the figure should have been 0.25 in.

Jute Mill of the LINEN THREAD CO. at Kearney, N. J.

Chart below shows very accurate control obtained with Powers regulation at the mill above.



CABLE ADDRESS: "HREADERS PATERSON"

The Linen Thread Company
Mechanical Department
GRAND ST. Paterson, N.J. Feb. 12, 1926.

Powers Regulator Co.,
2720 Greenview Ave.,
Chicago, Ill.

Gentlemen:-

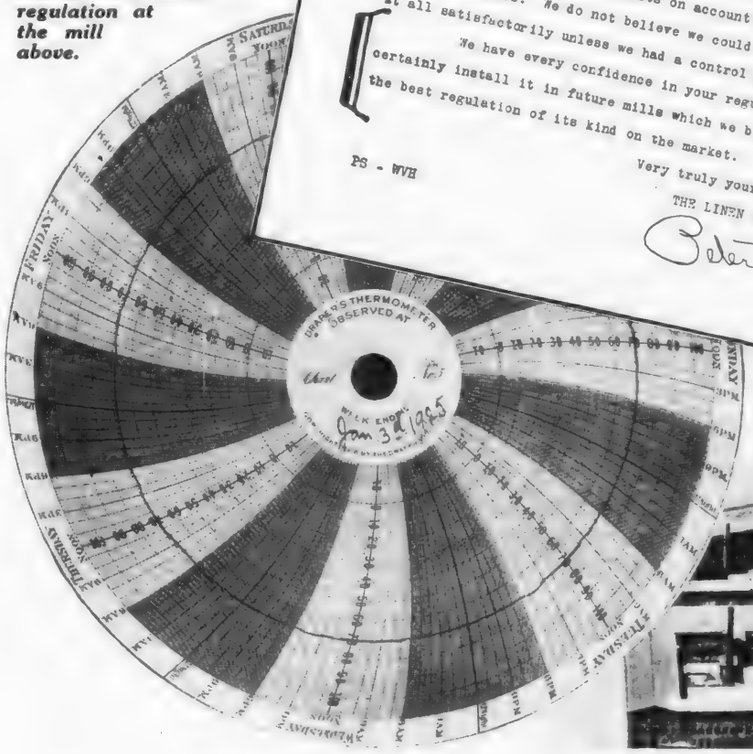
Some two years ago we investigated the different systems of heat control with a view to installing such systems in two of our mills. Would say that since that time installations have been made in the Finishing Department and Office at our Grand St. mill and in the entire new Jute Mill at Kearny, N. J.

We have kept accurate temperature records of heat in these rooms at various times and would say that the results accomplished by your control are certainly remarkable, particularly in our Jute Mill at Kearny where we need to control the temperature within very close limits on account of certain manufacturing processes. We do not believe we could have run this mill at all satisfactorily unless we had a control such as yours.

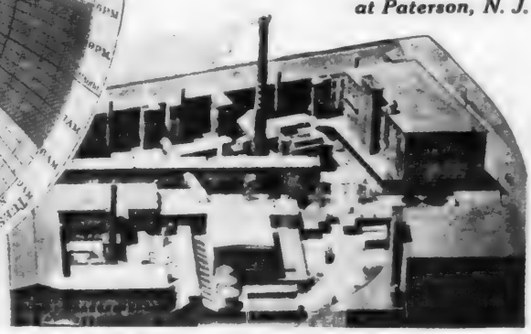
We have every confidence in your regulation and would certainly install it in future mills which we build, it being the best regulation of its kind on the market.

Very truly yours,
THE LINEN THREAD COMPANY
Peter Smith

PS - WVH



Grand Street mill of the LINEN THREAD CO. at Paterson, N. J.



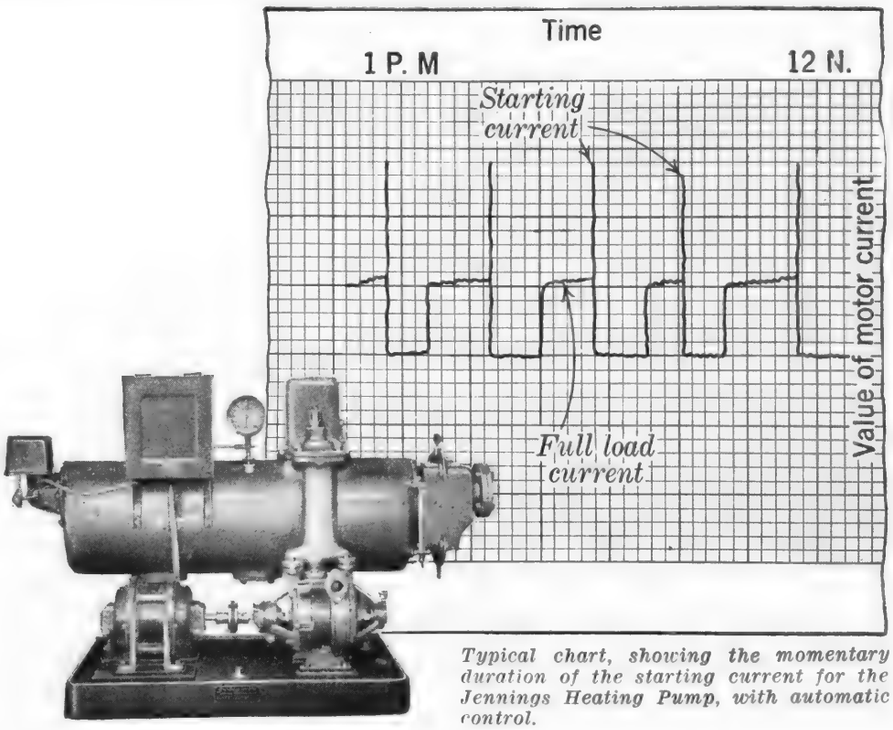
THE POWERS REGULATOR CO.

36 years of specialization in temperature control

2718 Greenview Avenue, Chicago

New York, Boston, Toronto, Los Angeles, and 30 other cities.

(RC3597)



Typical chart, showing the momentary duration of the starting current for the Jennings Heating Pump, with automatic control.

Peak current—but almost no power

At starting, the current taken by the Jennings Heating Pump is a maximum. But this peak current is only of momentary duration. It immediately falls to the normal full load value.

Since this drop takes place instantaneously, the power consumption at starting is negligible. So negligible, in fact, that it cannot be determined from the typical characteristic operating chart.

The only time the Jennings Heating Pump, with automatic control, is running is when the vacuum in the return line falls below a predetermined minimum. Or when the accumulated condensation in the returns tank rises above a specified level. The rest of the time the pump is not in operation. This makes possible a substantial saving in power.

NASH ENGINEERING COMPANY

81 Wilson Road **SO. NORWALK, CONN.**

Branch Sales Offices: Atlanta, Birmingham, Boston, Buffalo, Chattanooga, Chicago, Cleveland, Dallas, Denver, Detroit, Indianapolis, Kansas City, Los Angeles, Louisville, Memphis, Miami, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Tampa, Washington, D. C. **In Canada:** Montreal, Toronto and Vancouver. **European Offices:** London, Eng., Norman Eng. Co.; Brussels, Belgium, and Amsterdam, Holland, Louis Reijners & Co.; Oslo, Norway, and Stockholm, Sweden, Lorentzen & Wettre.

Jennings Pumps

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

Trade and Miscellaneous Notes

Coming Events

March 31-April 7, 1928. Eighth annual "Own-Your-Home" Building and Equipment Exposition in Chicago. Headquarters at the Coliseum.

April 3-5, 1928. Fifth annual convention of the American Oil Burner Association in Chicago. Headquarters at the Stevens Hotel.

April 17-19, 1928. Annual convention of the National Warm-Air Heating and Ventilating Association in Chicago. Headquarters at the Stevens Hotel.

May 7-10, 1928. Thirty-second annual meeting of the National Fire Protection Association in Atlantic City, N. J. Headquarters at the Hotel Chalfonte-Haddon Hall.

May 7-10, 1928. Annual meeting and exhibition of the Natural Gas Department of the American Gas Association in Dallas, Tex. Headquarters for meeting will be at the Fair Park Auditorium, and the exhibition will be held in the Manufacturers Bulding.

June 4-7, 1928. Thirty-ninth annual convention of the Heating and Piping Contractors National Association in Philadelphia, Pa. Headquarters at the Bellevue-Stratford Hotel.

June 12-15, 1928. Annual convention of the National District Heating Association at Atlantic City, N. J. Headquarters at Ambassador Hotel.

June 26-29, 1928. Semi-annual meeting of the American Society of Heating and Ventilating Engineers at West Baden, Ind. Headquarters at West Baden Springs Hotel.

Oct. 8-12, 1928. Tenth annual convention of the American Gas Association in Atlantic City, N. J.

Miscellaneous Notes

January building operations, reported by the F. W. Dodge Corporation, show an increase of 11% over January, 1927, and this is next to the largest January total on record. Compared with December, the past month showed a decline of 11%. The figures for 37 States, east of the Rocky Mountains, were $427,168,700. Analysis of the January building record show that 45% of all construction was for residential buildings, 17% for public works and utilities, 16% for commercial buildings, 9% for industrial buildings, 5% for educational buildings, 3% for hospitals and institutions, 2% for social and recreational projects, 1% for public buildings, and 1% for religious and memorial buildings.

In New York State and northern New Jersey contracts amounted to $130,705,400, this figure representing an increase of 10% over January, 1927, and an increase of 1% over December. This was the second highest January total on record for this district. For the New England States contracts amounted to $35,975,400. This is the highest January contract total on record for this district, and represents an increase of 109% over the figure for January of last year, as well as an increase of 17% over the December total. In the Middle Atlantic States contracts were $51,284,800, exceeding the December figure by 13% and being 4% below the figure for January, 1927.

The Pittsburgh district figures amounted to $28,345,200, this total representing a decline of 33% from December and 43% from January of last year. In the Central West figures amounted to $114,317,000, which is the largest total yet recorded in this district for the month of January, and represented an increase of 35% over January of last year, but showed a decrease of 30%

"The Mark of a Well-Built Fan"

Automobiles and Ventilation

READ an automobile ad. Then listen to the salesman as he talks. Back of his car's merits is something far deeper, vastly more stirring than any piece of man-made machinery will ever be.

What is it? It's the **joy** and **health** and **satisfaction** of care-free motoring! That's what sells the car.

So, in selling Autovent Fans

Remember to talk hot-weather comfort, fewer headaches or bigger production. That's what sells the fan! The oftener you picture lasting results from **dependable** Autovent Fans, the faster your business expands.

Have you our catalog and discounts? If not, write.

Estimates and prices cheerfully furnished by our Engineering Department.

AUTOVENT FAN & BLOWER CO.
1805-1827 N. Kostner Ave., CHICAGO
ENGINEERS IN ALL PRINCIPAL CITIES

AUTO [Automatic] VENT [Ventilation]
[GUARANTEED]

from December. The Northwest figures were $3,102,000, representing an increase of 25 % over that for January, 1927, and 2% over the December figure. Figures for the Southeastern States amounted to $46,795,000. This was the next to the highest January total on record for this district, showing an increase of 11% over January of last year, but a decline of 5% from December. For Texas figures amounted to $16,633,900, being the largest amount yet recorded in January for this state, and represents increases of 7% over January, 1927, and 26% over December.

Purdue University, Lafayette, Ind., has planned a series of lectures for the class in business administration, which is given the second semester of each school year for senior students in engineering. The lecture scheduled for April 10 will be on the subject of "Technical Journalism," by P. E. Fansler, associated editor, THE HEATING AND VENTILATING MAGAZINE.

Walter C. Kimball, vice-president in charge of sales of the International Heater Co., Utica, N. Y., has resigned to become associated with William A. White, real estate operators in New York City.

Chicago Association of Consulting Engineers held a meeting and annual election of officers at the City Club, January 16, and the present officers were re-elected. They are: President, Irving E. Brooke; vice-president, Ernest V. Lippe; secretary-treasurer, Rollo E. Gilmore.

Berg Heating and Ventilating Co., 742 Laura Ave., Huntington Park, Calif., has added a steam heating department to its business, with P. J. Dougherty in charge. Mr. Dougherty was formerly engineer of the International Heater Co., Utica, N. Y., and also served on the A. S. H. & V. E. Boiler Code and Smoke Ordinance Committees.

National Association of Power Engineers, is the name under which the National Association of Stationary Engineers will be known hereafter. The action to this effect was taken by referendum vote. The 46th Annual Convention of the association will be held in Detroit, September 10-15. In connection with the convention a show to be known as the Detroit Power and Mechanical Exposition will be held at Convention Hall, Detroit, September 10-14. Garrett N. Burgess, 5522 Underwood Ave., Detroit, is convention chairman.

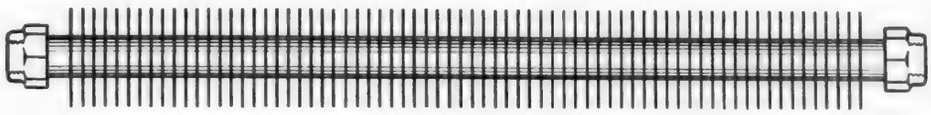
Fourth Annual Three-Day Institute for the Plumbing and Heating Industries will be held at the Carnegie Institute of Techonology, Pittsburgh, Pa., March 21-23, according to an announcement by Samuel E. Dibble, Theodore Ahrens professor of plumbing, heating and ventilating. One of the days will be devoted to accounting and business for the contractors and another to the transmission of heat from coal, gas and oil into water.

Lionel L. Jacobs, of Toronto, Can., who is president of the American Oil Burner Association, has been elected a vice-president of Electrol, Inc., of Missouri. Mr. Jacobs has been a stockholder of this company.

Eastern Supply Association held a two-day session at the Hotel Astor, in New York, February 8-9. Among the speakers were Joseph Ewing, president of Edwards, Ewing & Jones, who stated that for some time he had been impressed by the untouched market for heating and plumbing goods. Mr. Ewing also stated that the heating and plumbing industries have less "selling sense than any industry he knew," and followed this statement with slides showing some of the results of a survey conducted by his company, which showed only 22% of homes having adequate heating and plumbing. Mr. Ewing believes that intelligent control of salesmen's work will help solve the problem, inasmuch as it already has been done so in other lines in boosting volume and profits.

Arthur H. Ballard, Inc., 535 Commonwealth Ave., Boston, Mass., announces that his factory sales and service for the Metropolitan area at 608 Central Ave., East Orange, N. J., has been awarded the contract to install Ballard Junior oil burners under two boilers in the home office building of the Standard Oil Co., 185 Washington

Convecto Radiators for Industrial Uses



Single Tube Radiator

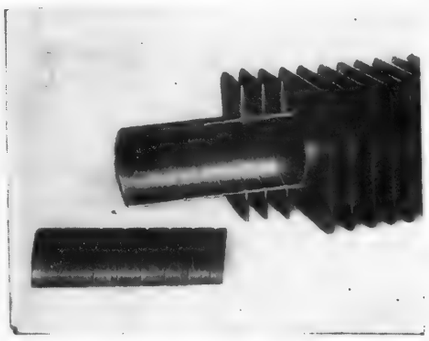
CONVECTO Single Tube Radiators are available in lengths of 12 feet or less, and are made of Copper Tubes and Copper Fins, Brass Tubes and Steel Fins, Steel Tubes and Steel Fins, as may be required.

Where a large amount of surface is required in a compact form, it is possible to assemble the Single Tube Units, by means of return bends, or fittings, to meet any installation condition that may confront the Engineer.

The Convecto Radiators have been successfully used in many industrial problems of heating, cooling, in vats, tanks, dryers, yachts, steamships, etc., where rugged construction, compact form, light weight, are a consideration.

Convecto Radiation has from 9 to 27 times the radiating surface of plain tube, with proportionate increase in efficiency.

Complete information in our new catalog just issued



Illustrating a CONVECTO Extended Surface Tube with part of the wall cut away to show the inside of the tube. The ridge made by the grip of the fins is shown (1) and the groove made by the fins is shown at (2).

METAL STAMPING COMPANY

Long Island City, N. Y.

THERMOLIER

INDUSTRIAL TYPE

perfected by Grinnell

50 years heating experience in 4 square feet

HERE'S a development of unit heaters that will confirm your opinion that this type of heating is destined to become standard for industrial and commercial buildings.

Thermolier has the ruggedness, the dependability and the practical engineering features that you have been waiting for.

Grinnell Thermolier is the type of unit that you would expect from a firm that for half a century has been meeting and mastering all sorts of industrial heating problems. That practical experience is built into Thermolier in many ways. In the indestructible copper housing, for instance, or in the unique cooling leg which is an integral part of the unit.

These and twelve other features are described in our pamphlet "Grinnell Thermolier — Industrial Type." Fill in the coupon and get your copy now.

GRINNELL COMPANY

Executive Offices: Providence, R. I.

Branches in all Principal Cities

14 Points of Superiority

GRINNELL COMPANY, INC.
208 W. Exchange St., Providence, R. I.

I want to read more facts about the Thermolier. Send along the leaflet.

Name_____

Address_____

City_____

W. W. Wetmore Corp., McKinley Bldg., 259 Delaware Ave., Buffalo, N. Y., has acquired the business of the Buffalo Gas Radiator Corp., of North Tonawanda, N. Y. The Wetmore corporation is planning to market within the next 90 days an entirely new line both of gas and electric radiators in an attractive slim type. The gas radiators will be of the vented and unvented types. All the present appiances in the Buffalo line will be continued. W. W. Wetmore was formerly vice-president of the Buffalo Gas Radiator Corporation.

Plumbing and Heating Development League of Philadelphia has formally been organized to promote a wider sale of heating and plumbing equipment and services in the Philadelphia market. The Philadelphia market development plan is a joint operation of the Plumbing and Heating League of Philadelphia and the Heating Industries' Bureau, formerly the National Trade Extension Bureau. The plan calls for an expenditure of $71,000 for promotional purposes over a period of one year. The Master Plumbers' Association of Philadelphia has pledged $10,000 to the fund, while the Plumbing and Heating Industries' Bureau, in addition to a cash distribution, has assigned E. L. Flentje as the Bureau's representative in Philadelphia for the duration of the market development program. Newspaper advertising will be the backbone of the campaign. The officers of the league are: President, George Wobensmith, of the Hajoca Corporation; vice-presidents, C. W. Wanger, John Quinn and W. A. Bland; secretary, Raymond C. Green, and treasurer, A. M. Maddock.

Walters Construction Co., Manhattan, Kan., has received contract for a 400-ft. tunnel to connect the new college heating plant now under construction at Manhattan with the present heating system, for $6,644.17.

Manufacturers' Notes

Johns-Manville Corp., New York, held a meeting of stockholders at which it was voted to reduce the number of directors from twenty-four to nine. The following were selected: Walter H. Aldridge, Francis D. Bartow, Edward H. Manville, Thomas F. Manville, Theodore F. Merseles, William R. Seigle, George Whitney, A. C. Hoyt and E. W. Debevoise.

McIlvaine Burner Corp., Evanston, Ill., announces that it has combined the general offices, formerly located at 6 North Michigan Ave., Chicago, with the assembly, testing and service plant at 749 Custer Ave., Evanston. Chicago display room will be maintained at Revell's, Wabash and Adams Streets.

Equipment and Supply Co., Louisville, Ky., has opened offices and display room, centralizing all forms of mechanical equipment, machinery, construction materials and supplies.

National Pipe Bending Co., New Haven, Conn., manufacturer of heat exchange apparatus, has appointed J. Harold Flynn to the engineering staff to take charge of new products development. Mr. Flynn has had several years of experience in the power plant field, specializing in the design of oil apparatus.

Crane Co., 23 West 44th St., New York, announces the appointment of G. B. Nichols as engineer of the company in New York. Mr. Nichols was formerly chief engineer in the New York State Architect's office and more recently was connected with Hegeman and Harris, of Boston and Chicago.

Ric-wiL Co., Cleveland, O., manufacturer of underground conduit systems, has appointed F. A. Tucker to its engineering staff. Mr. Tucker, for the past 12 years, was connected with the Danville Division of the Illinois Power and Light Corporation as operating engineer in charge of the company's heat lines.

Lincoln Electric Co., Cleveland, O., has appointed A. M. MacFarland as a general sales and development engineer.

Hoffman Heater Co., Louisville, Ky., announces a rearrangement of the management of the company and the following changes in personnel: John G. Dorn, first vice-president and director, has

TENTACULAR

Higher Efficiency in POWER TRANSMISSION

A Typical SHORT CENTER DRIVE

DRIVE RIGHT MEMBER OF POWER TRANSMISSION ASSOCIATION

Exhibited New York and Chicago Power Shows

Hundreds of Similar Drives can be seen in actual operation

TENTACULAR Success Book Sent on Request

Manufacturers of a Complete Line of Leather Belting

Alexander Brothers, (INC.)

14 SOUTH STREET, PHILADELPHIA, PA.

Branches and Distributors in All Principal Cities

In Thousands of Buildings

Office Buildings, Hotels, Theatres, Hospitals and Schools, the Original Genuine Sylphon Bellows controls the temperature of service hot water, of air duct systems, of heating and ventilating of feed water and of brine cooled refrigerating systems.

In Most Industrial Plants

Sylphon Instruments find extensive application in temperature control in Textile Mills, Chemical and Leather Plants, Food and Meat Packing Plants and Laundries.

In Great Power Plants

Sylphon Instruments maintain constant temperatures of feed water to boilers, the cooling water for Diesel Engines, maintain correct temperature of fuel oils and cut off the oil supply when the atomizing pressure drops below a safe minimum.

In Homes of the People

Sylphon Damper Regulators, now factory equipment on 35 of the leading makes of boilers, afford comfort and positive fuel economy.

In Your Service let us send you complete detailed Information and let our engineers assist in solving your particular problem, all without obligation to you. Just send coupon or write if you prefer.

The ORIGINAL GENUINE SYLPHON BELLOWS

The motor element in all Sylphon Instruments is the most accurate, durable and flexible temperature control unit known to science.

THE FULTON SYLPHON COMPANY, *Knoxville, Tenn., U. S. A.*

Sales Offices: New York, Chicago, Philadelphia, Boston, Detroit. All Principal Cities in the U. S.

Dept. W

Gentlemen:

We are interested in the application of Sylphon Bellows to

_____

Name_____

Company_____

Address_____

City_____ State_____

THE FULTON SYLPHON COMPANY
Sylphon
AUTOMATIC TEMPERATURE CONTROL

been elected president; A. W. Lissauer, formerly president, has resigned to devote his entire attention to other interests; O. P. Simler, formerly vice-president and general manager of sales of the company, has been elected vice-president and general manager; R. W. Johnston, formerly district manager of the Chicago office, has been assigned to the general office staff at Louisville as assistant manager. C. I. Baker returns to the general office staff to become chief engineer, and T. H. Jones returns to the company to become assistant chief engineer.

National Radiator Corp., Johnstown, Pa., held its annual sales meeting in Trenton, N. J., January 22-24.

Excelso Products Corp., Buffalo, N. Y., held its annual sales meeting at the Statler Hotel, Buffalo, N. Y., January 13-14. C. W. Farrar, president of the company, presided and stated that 1927 had been the best year on record for the company, and that the sales organization had not changed its personnel since its inception. Plans for the year were discussed.

Green Foundry and Furnace Works, Des Moines, Iowa, is holding seven schools of instruction on forced circulation warm-air furnace heating for its salesmen and dealers. J. C. Miles, vice-president of the Warm-Air Furnace Fan Company, and inventor of the Miles automatic furnace fan, was scheduled to speak at each of these meetings and to present his subject with examples and questions, with open discussions to follow. The meetings were to be held at the following cities on the dates specified; Des Moines, Iowa, Savery Hotel, February 27-28; Peoria, Ill., Jefferson Hotel, March 1-2; Madison, Wis., Lorraine Hotel, March 5-6; Minneapolis, Minn., West Hotel, March 8-9; Sioux Falls, S. D., Carpenter Hotel, March 12-13; Lincoln, Neb., Cornhusker Hotel, March 15-16; Kansas City, Mo., Baltimore Hotel, March 19-20.

Jones & Laughlin Steel Corp., Pittsburgh, Pa., announces the e'ection of T. M. Girdler as president of the company to succeed the late B. F. Jones, Jr., who died recently. W. J. Creighton was elected a vice-president and also a member of the board of directors. W. C. Robinson also was elected to the board of directors. W. H. Dupka has been appointed controller and assistant secretary. A chairman of the board of directors will be appointed at a later meeting, it was announced. William D. Evans and William L. Jones, Jr., have been appointed members of the executive committee.

L. J. Mueller Furnace Co., Milwaukee, Wis., announces the appointment of Roy M. Moffett as general branch manager of the Chicago office. Mr. Moffett has been with the company for the past five years and formerly traveled in the Ohio territory for the company.

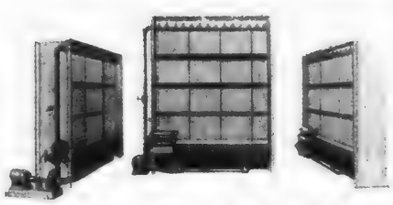
Raritan Radiator Co., Raritan, N. J., has appointed William T. Leonard, formerly with the Columbia Radiator Co., as sales manager, with headquarters at the main offices of the company.

Evins F. Glore & Son, Inc., Grand Central Terminal, New York, has been appointed exclusive sales representative for Hart & Crouse Co., Utica, N. Y., in the metropolitan New York territory. The Glore company will merchandise to the wholesale trade the boilers made by the Hart & Crouse Company.

Preferred Oil Burners, Inc., Peoria, Ill., announces that R. L. Sutzman, recently district representative for Williams Oil-O-Matic Heating Corp., has been appointed southeastern division manager for the company, with headquarters at Atlanta, Ga. J. G. Dierkes, formerly with Merchants' & Manufacturers' Securities Co., is manager of the Chicago division of the company. W. A. Matheson, formerly with Power Plant Engineering Company, is now assistant sales manager. F. E. Heighway, recently advertising manager of Lincoln Oil Refining Company, is assistant advertising manager.

Bodine Electric Co., 2254 W. Ohio St., Chicago, manufacturer of fractional horse-power motors, has appointed H. A. Hallead as sales manager. Mr. Hallead was formerly connected with the Boxill-Bruel Carbon Company, of Columbia Park, O., as its sales engineer.

Ask Users!—that's the real test



Typical installation of small ACE Automatic Filters. 3 Units at the Manufacturers & Traders Trust Co., Buffalo, N. Y. Total capacity—50,000 C.F.M.

High sounding claims for a product are easy to make,—but how does the product live up to them in service? That is the question on which attention should be focused. This is particularly true of Air Filters. And it is the reason why we are always eager to have anyone interested in air cleaning take the time to see the ACE in action and to talk to users. For ACE performance has converted ACE claims into FACTS.

Typical large ACE installation. One of 5 units at Cincinnati Masonic Temple. Total cap. 280,000 C.F.M. ACE Filters are cleaning the air in hospitals, schools, office buildings, hotels, clubs, theatres, stores and industrial plants all over the country.

ACE Automatic, Self-Cleaning AIR FILTER

is rapidly winning favor because:—it is an efficient air cleaner; it eliminates completely the human factor from filter operation; it maintains its efficiency throughout service life, automatically; it is simple, sturdy, positive; it is easy to erect and takes up less floor space per capacity than others; its erection, operation and maintenance costs are pleasingly low; it is proving in actual service that these are not merely claims, but facts. Built in all capacities, for all air cleaning applications.

Write for complete details and quotations

General Air Filters Corp.
Division The W. B. Connor Co. Inc.
369A Lexington Ave., New York
Manufacturers of Air Conditioning Equipment, Air Filters, Air Washers, Spray Nozzles

International Heater Co., Utica, N. Y., announces the appointment of Samuel H. Allston as advertising manager.

United States Radiator Corp., Detroit, Mich., has filed a notice with the Secretary of the State of New York of an increase in its no-par common stock from 200,000 to 400,000 shares. In January, 1926, the stock was split on a five-for-one basis, and 200,000 shares of no-par common stock were issued to replace 40,000 shares of $100 par common stock.

Domestic Stoker Co., 7 Dey St., New York, announces that R. E. King, formerly with the Spencer Heater Co., has joined the executive force of the company, to assist E. E. Van Vliet, manager of sales.

United States Radiator Corp., Detroit, has appointed Fred H. Blackmore manager of the operating department of the corporation to take charge of its six plants. For the past 15 years Mr. Blackmore managed the Edwardsville, Ill., plant of the company. M. H. Stimson has been appointed to succeed Mr. Blackmore at Edwardsville.

Williams-Oil-O-Matic Heating Corp., Bloomington, Ill., announces that Russell D. Barnes has been appointed manager of the Chicago branch of the company. Mr. Barnes is vice-president of the Chicago Oil Burner Association and is one of the pioneers in the Chicago oil-burner industry.

William H. Page Boiler Company and the **Federal Radiator and Boiler Company** announce the formation of a company to represent them in the Philadelphia district. The new organization will be known as a branch of the William H. Page Boiler Company. Miles Standish, formerly Philadelphia manager for the Union Radiator Company, and recently associate manager of the National Radiator Corporation, in Philadelphia, will head the new branch company. H. R. Urian, George E. Glover and S. M. Glading, all formerly with the Union Radiator Company, will be members of the organization. Offices and warehouses have been established at 1124-32 Washington Avenue.

National Horizontal Furnace and Research Association held its eighth annual convention at the plant of the P. H. MaGirl Foundry and Furnace Works, Bloomington, Ill., February 6-8. This organization is comprised of distributors of the National horizontal superheaters manufactured by the MaGirl Company. Officers elected were: President, W. B. Hickerson, president of the W. B. Hickerson Heating Co., Denver; vice-president, Eric D. Lane, secretary of the Stanton Heater Co., Martins Ferry, O.; secretary, G. A. Helwig, president of the National Heating and Ventilating Co., St. Louis. Dr. E. Vernon Hill addressed the members, during the convention, on the subject of "Air Conditioning," and R. J. Stewart, H. E. Carlson and Henry Mathis, president of the New York Blower Company, also spoke.

Security Stove & Mfg. Co., Kansas City, Mo., announces that the Security Oil Burner Company of New York, 60 Broadway, Flushing, N. Y., are exclusive distributors in New York, New Jersey, Connecticut and Delaware. Also that the Security Sales Co., 739 Boylston St., Boston, Mass., are exclusive distributors in the New England States.

New Firm

Paul E. Sowers Co., 25 North Duke St., York, Pa., has been formed by Paul E. Sowers, W. Frank Martin and Albert A. Krepps, who formerly were connected with the Vapor Heating Co., of York. The new company of engineers will specialize in heating and ventilating, vapor and vacuum heating specialties, and power plant equipment.

Merger

United Engineers and Constructors, Inc., Philadelphia, Pa., has been organized combining the U. G. I. Contracting Company, of Philadelphia, Public Service Production Company, of Newark, Dwight P. Robinson & Company, Inc., of New York, and Day & Zimmerman Engineering and Construction Company, of Philadelphia. The principal office of the new company will be located at the northwest corner of Broad and Arch Sts., Philadelphia. Dwight P. Robinson is the new president of the company.

Two Mergers Announced of Four Steel Companies

Four steel companies have made plans for two large mergers, it has been announced, and the two new companies will have combined assets of over half a billion dollars. The Youngstown Sheet and Tube Company, of Youngstown, O., will merge with the Inland Steel Company of Chicago. The Trumbull Steel Company will merge with the Republic Iron and Steel Co. Assets of the Youngstown-Inland Steel consolidation will be more than $325,000,000, which consolidation places the Youngstown company as the third largest steel organization of the country. The Republic-Trumbull companies take rank as the fifth greatest steel company in the country, with assets estimated at $165,000,000.

R. B. Leckie Named Professor of Gas Engineering at Purdue University

As a result of the establishment of a chair of gas engineering at Purdue University, it is announced that R. B. Leckie, until recently with the Semet-Solvay Co., New York, has been appointed professor of gas engineering. Professor Leckie will have charge of the research work contemplated by the Indiana Gas Association, whose gift of $10,000 a year makes possible the establishment of this chair.

Professor Leckie was graduated from the University of Glasgow and before coming to this country enjoyed a high repute in the gas industry of the British Isles.

Change of Address

National Regulator Co., 2301 Knox Ave., Chicago, announces that its New York office has been moved to larger quarters at 196 Lexington Avenue.

KAUFFMAN

AIR DIFFUSERS

SINCE 1908

Kauffman Air Diffusers

HAVE BEEN IN USE IN

Some of America's Finest Theatres

Simple to Install—Low in Price

Graduated Air Control

AMERICAN METAL PRODUCTS CORP.

ST. LOUIS, U. S. A.

Classified Advertising

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of a complete line of Cabinet Heat Units, and Extended surface Radiators for all purposes, desires recognized representatives on commission basis. Address Box 39, care of Heating and Ventilating Magazine.

SALESMEN WANTED — Boiler manufacturer requires the services of several A-1 salesmen for the New York Metropolitan District and Long Island. Must be thoroughly familiar with cast iron boilers and low pressure heating. Reply in detail. Address Box 310, care of Heating and Ventilating Magazine.

POSITION WANTED—with heating contractor, estimating, design, supervise installation, closing contracts, business management. Have had twenty years' heating experience. Address Box 34, care of Heating and Ventilating Magazine.

SALES ENGINEERS WANTED—Old established company, manufacturing high-grade vapor heating specialties, has some territories open at the present time. Write if you are interested in selling this line on a commission basis. State territory and other lines. All communications held strictly confidential. Address Box 38 care of Heating and Ventilating Magazine.

POSITION WANTED—Construction manager and estimator desires connection with a heating and power piping contractor. Thoroughly experienced in estimating, supervising, purchasing, handling sub-contracts, etc. Address Box 32, care of Heating and Ventilating Magazine.

WANTED—Heating sales-engineer of proven sales and engineering ability and experience is required by a nationally known and recognized manufacturer and distributor of vapor heating specialties to represent them in southeastern Pennsylvania and Maryland, a fertile territory in which we have been long and favorably known. Do not reply unless you can qualify as to sales and engineering ability, and have ability to make heating plans and direct draftsmen and service men, and will be able to continue our long established contact with our high grade clientele among architects, engineers and heating contractors. Mail your credentials with application. Address Box 33, care of Heating and Ventilating Magazine.

SALES REPRESENTATION—Sales organization calling on heating and power trade would like to add a line of steam specialties or similar products. Address Box 35, care of Heating and Ventilating Magazine.

POSITION WANTED—As boiler and radiator salesman. Can show past record; especially familiar with the sale of new tube radiation. Have had twenty years' heating experience. Age 39. Address Box 31, care of Heating and Ventilating Magazine.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of fans, air washers and unit heaters, desires recognized representatives on commission basis. Address Box 37, care of Heating and Ventilating Magazine.

SUPPLY YOUR LIFE'S LUXURIES WITH TECHNICAL TRAINING!

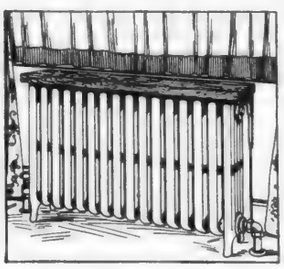
Let the ST. LOUIS TECHNICAL INSTITUTE help in solving your trade problems. Find your pay streak—have steady employment—deserve higher positions—have pride and personality in your work. For 18 years we have specially trained quite an army of men. Our Courses are admirably suited to qualify you in an Engineering way. Select your course, full information is free—no obligation because our School is one of Service.

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

Saint Louis Technical Institute.
Est. 1910
The most thorough institution for Technical Home Study to-day.
4543 Clayton Avenue. St. Louis, Mo.

Modern Radiator Shields

Mean More Profit on Every Job



Besides beautifying your installation, each radiator equipped with a Modern Radiator Shield means an added profit to you as a Modern Dealer. Every radiator installation is an almost certain prospect for the sale of Modern Baked Enamel Shields and Art de Luxe Cabinets.

We can take care of any job from plain shields to complete radiator furniture, in pattern, or to match any decoration scheme. Regular stock shields have a beautiful original finish.

Radiator Shields and Cabinets are becoming very popular, and the Modern line represents a profitable business for the heating contractor. ***Write for Prices and Dealer Agreement***

Acme Radiator Shield Co., Inc.
Manufacturers of "Modern" Radiator Furniture.
48 and 50 Vine Street, Cincinnati, Ohio

E Z
RADIATOR HANGER

Use this *complete* line. E-Z Hangers are made for *ALL* tube-type radiators as well as all standard types. Complete stocks in principal cities.

Prompt shipments.

Healy-Ruff Co.
772 Hampden Ave.
St. Paul, Minn.

Style R

VENTURAFIN

TRADE MARK

METHOD OF UNIT HEATING

Active Heat—

and INCREASED SALES and PROFITS

Heat With Unit Heaters

There is a size and type of Venturafin unit for factories — garages — stores — offices — shops — warehouses — assembly halls and countless other places. Send the coupon today for complete information on selling the Venturafin Method of Unit Heating. Let us show you the way to more sales and greater profits with this proved, modern, highly efficient heating equipment.

Heating and Ventilating Engineers are quick to recognize the many advantages of the Venturafin method with its active heat—more even distribution of heat—light weight and more than five times the efficiency of ordinary heating methods. If you are a Heating and Ventilating Engineer and have not received complete data on Venturafin, write today and we will supply you with all the facts for your files.

AMERICAN BLOWER CORPORATION, DETROIT
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.
BRANCH OFFICES IN ALL PRINCIPAL CITIES

(718)

American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

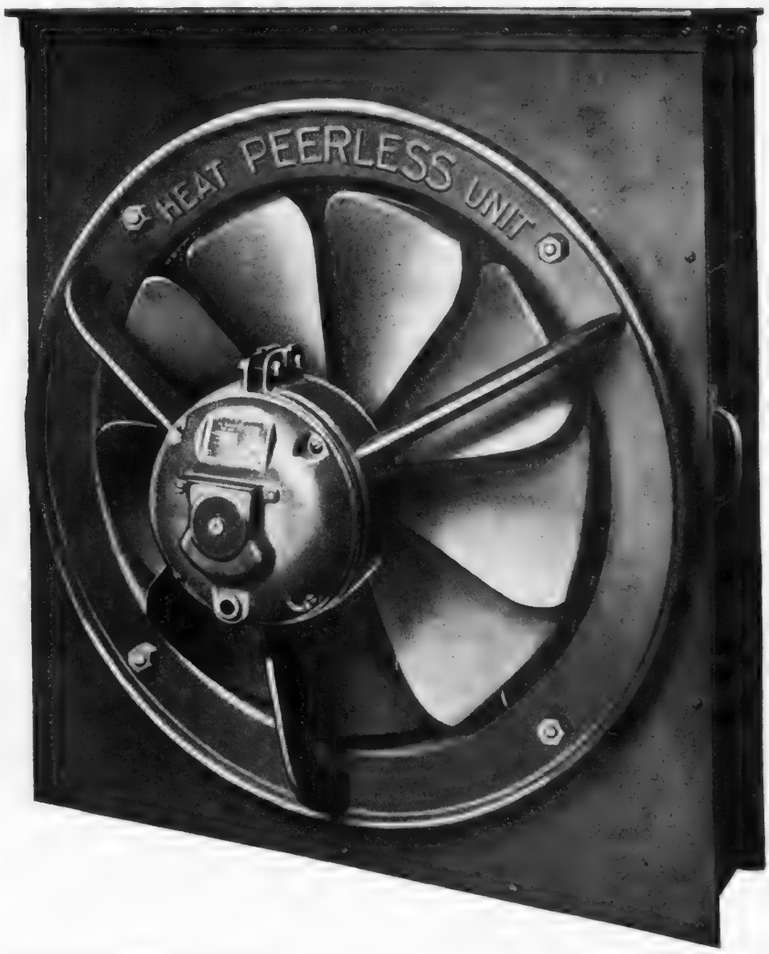
MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

COUPON

AMERICAN BLOWER CORPORATION, 6000 RUSSELL STREET, DETROIT, MICHIGAN
Send details relative to the Venturafin Method of Unit Heating to

*Name*_____ *Firm*_____

*Address*_____ *City & State*_____



Low first cost, good Profits, with Unit Heaters

IN THESE DAYS of keen competition, the low first cost of Peerless Unit Heaters, as compared with less modern systems of heating, has enabled many a contractor to land a job that otherwise would have gone elsewhere. And, even more important, the cheaper job gives your customer better service. To-day the contractor and engineer who knows all about the unit system has a distinct advantage in figuring on industrial jobs.

If you are thinking along this line, the booklet at the left will be helpful. Send for it. Bear in mind that Peerless Units are made in the same shops which produce the well-known PeerVent Heating and Ventilating System, used in school buildings throughout the country.

Mail this! with your letterhead, please

To Peerless Unit Ventilation Co., Inc.,
718-34 Crescent Ave.,
Bridgeport, Conn.

☐ Send booklet about Unit Heaters.

☐ Send your local representative.

H

PEERLESS UNIT VENTILATION CO., Inc.

718-34 Crescent Ave., Bridgeport, Conn.

NEW YORK, 369 Lexington Ave.; BOSTON, 100 Boylston St.; BUFFALO, 135 University Ave.; HARRISBURG, 705 Telegraph Bldg.; CLEVELAND, 1836 Euclid Ave.; DETROIT, 1214 Lafayette Bldg.; CHICAGO, 808 Monadnock Bldg.; MINNEAPOLIS, 240 Seventh Ave. So.; PORTLAND, ORE., 927 Board of Trade Bldg.; TORONTO, CANADA, Darling Bros., Ltd., 77 York St.

PEERLESS

UNIT HEATER

S I L E N C E

For silent unit ventilation . . .
Specify the "Silent" Sturtevant

NOISELESSLY, the new Sturtevant Unit Ventilator draws in fresh energizing air. Not a sound comes from the attractive metal cabinet to disturb the quiet of the schoolroom, church, or office.

Silent unit ventilation is an outstanding Sturtevant achievement. Fan wheels, fifty per cent larger in diameter than those used in other unit ventilators of the same rating, make it possible to run the fan very slowly . . . moving the air noiselessly at a low velocity. A saving in electric power is also accomplished through using a slow speed fan.

For silent unit ventilation . . . specify the "Silent" Sturtevant Unit Ventilator. Bulletin No. 344-A contains complete information. Write to our nearest office for a copy.

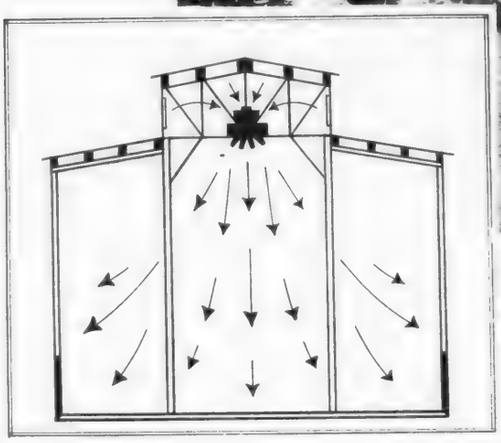
B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

Atlanta, Boston, Buffalo, Camden, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Hartford, Indianapolis, Kansas City, Los Angeles, Minneapolis, Montreal, New York, Pittsburgh, Portland, Rochester, St. Louis, San Francisco, Seattle, Toronto, Washington

Sturtevant REG. U.S. PAT. OFF. the Silent Unit Ventilator

WING FEATHERWEIGHT UNIT HEATERS

VERTICAL PROJECTION OF WARM AIR TO THE WORKING LEVEL



Five Wing Featherweight Heaters in the above plant of the General Electric Co.

Diagram at left shows the action of Wing Heating. Air is gathered in from the top of the building where it is already warm. After reheating in the Wing Heaters, it is forced to the working level and is gently and uniformly circulated.

UNIT Heaters are placed at or near the roof in the Wing method of heating. This is done to recover the heat which rises to the top of the building. You know how hot it gets there!

Wing Featherweight Unit Heaters regain this heat and put it where it is wanted—that is, at the working floor. They gather in the warm air from the upper spaces and circulate it again to the working area.

The Wing principle of heating is common sense. And it saves money for its users!

Floor and Side Walls Free

Because of their overhead location, Wing Heaters save every square foot of floor space for production. This is important where the manufacturing area is already crowded and where floor space has a big money value.

Easy Wing Installation

Overhead location and light weight of heating units make all Wing installations simple and easy. Piping is carried overhead in straight line runs; a minimum of fittings is required. The simplicity of Wing installations appeals to the trade, and makes quick jobs and more jobs.

Wing installations cover every type of building and every line of industry. Practically every Wing installation results in repeat business. This is the best proof of user satisfaction.

L. J. WING MFG. CO.
Hudson and 13th Sts., New York City.

Please send me, without obligation, your Bulletin on Wing Featherweight Unit Heaters.

Name .....

Address .....

.....

Write for the Wing Condensed Heater Bulletin.

L. J. Wing Mfg. Co.

Hudson and 13th Streets
New York City

Lower Cost per B. T. U. with this improved heater

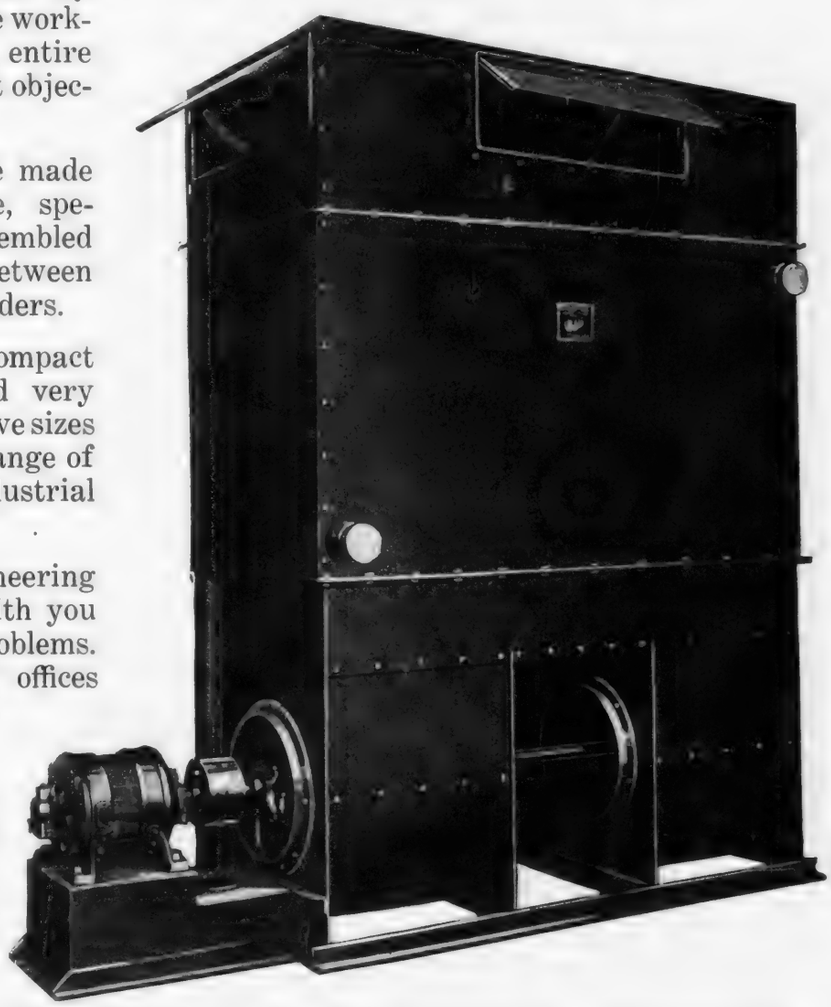
Higher efficiency, lower cost, simpler construction and easier installation are the four "high spots" in the improved Buffalo Type "AA" Unit Heater developed from fifty years' experience in air handling and heating.

Suitable for unusually high steam pressures, the Units are of the recirculating floor-type, taking in air near the floor line and delivering the heated air at comparatively high velocity above the working zone, so that the entire area is heated without objectionable drafts.

The heating coils are made from ½" steel pipe, specially formed and assembled in staggered rows between extra heavy steel headers.

The whole unit is compact and well made, and very quiet in operation. Five sizes provide a desirable range of capacities for all industrial requirements.

Let our capable Engineering Department work with you on your heating problems. Branch Engineering offices in all principal cities.

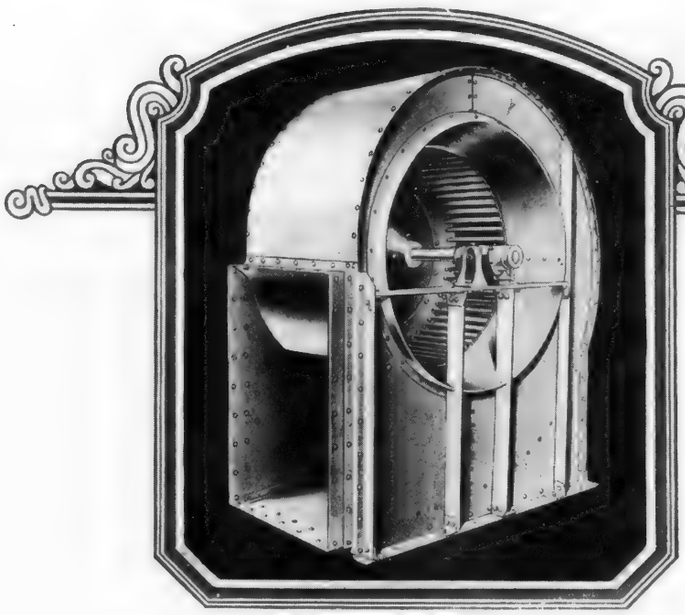


Buffalo Forge Company

480 Broadway . Buffalo, N. Y.

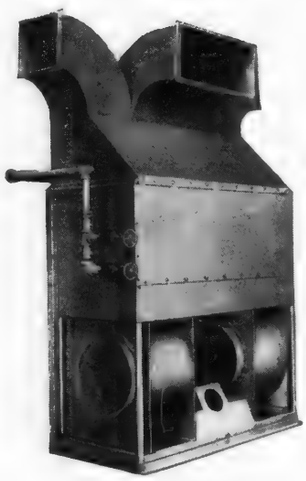
In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

1878 "Buffalo" 1928 — **"Air Engineers for Fifty Years"**

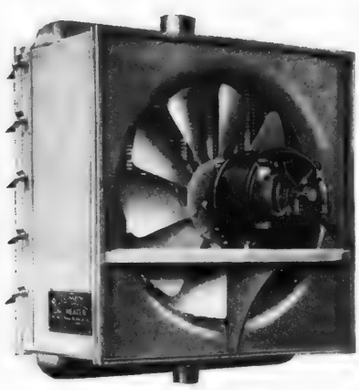


Type ME Fan

Each a Leader in its Field



Comet Unit Heater
Floor Mounted Type



Comet Unit Heater
Overhead Mounted Type

A LONG list of recent notable installations offers evidence of the supremacy of Type ME Fans and Comet Unit Heaters—each a leader in its field.

Whether your problem be the design of a large central system of heating and ventilating or the planning of a small, flexible heating system, there is a New York Blower Company product of a type and size to meet the condition.

Our technical staff is at your service for consultation without obligation, should you request it.

Representatives in principal cities

Fans—Blowers
Unit Heaters
Air Washers
Furnaces

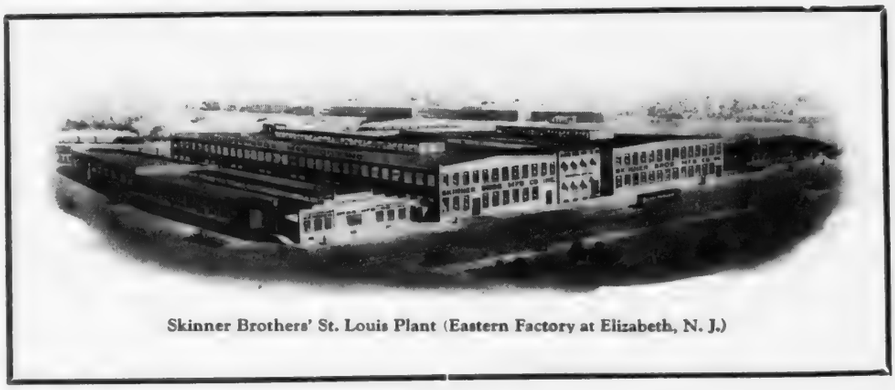
NEW YORK BLOWER COMPANY

General Offices
2242 So. Halsted St.
Chicago, Ill.

HEAT *and* VENTILATE MECHANICALLY—USE ME FANS *for* BEST RESULTS

Because of two outstanding factors, Skinner Engineers can show you (probably better than anyone else) how to

Save real money on your heating plant



Skinner Brothers' St. Louis Plant (Eastern Factory at Elizabeth, N. J.)

COMBINING a *34-year accumulation of heating experiences* with the *proved* effectiveness of the Skinner (Baetz Patent) Air Heater, Skinner Engineers are able to give you

"Work-Area" Heating at Lowest Cost

In practically every instance, whether called in first or after everybody else, they have been able to show where a substantial saving could be made.

Skinner men are not salesmen but Heating Engineers. Originating the Unit Method of heating, and adapting it to thousands of industrial plants, they have developed the Skinner Air Heater as the ideal source of warmth for the "Work-Area".

The Skinner Air Heater provides a steady, easily controlled supply of warmed air and diffuses it evenly throughout the entire space where your producers are working. It is designed to hold the heat down—not waste it warming unused space overhead. Special Skinner-designed multivane fans draw air into the heater from the floor line, pass it through a nest of steam pipes and discharge it just above the heads of the workers. As the air which is pulled away from the floor level must be replaced, the warm blanket of air above is drawn right down into the "Work-Area". Each employe is comfortably warm—none chilled—none overheated.

Suppose You Just Roughly Sum Up the Savings

that have come to innumerable industrial firms through Skinner service—the advantage of Skinner *engineering, saving perhaps thousands of dollars on heating equipment*—the *saving in fuel bills* which Skinner Engineers achieve by the scientific arrangement of the heating units—the *increased productivity of your employes* because of the more comfortable working condition. Then call in Skinner Engineeers and let them prove that they can bring *you* similar savings.

See phone book for branches in:

Cleveland	**Washington**
Buffalo	**Kansas City**
Detroit	**Pittsburgh**
Seattle	**Baltimore**
Chicago	**Philadelphia**
Boston	**Indianapolis**

Factories at St. Louis and Elizabeth, N. J.

MAIL COUPON TODAY

Skinner Bros. Mfg. Co., Inc.,
1450-90 S. Vandeventer
St. Louis, Mo.

I am interested in:

- ☐ Heaters
- ☐ Ventilators
- ☐ Dryers
- ☐ Dust Collectors
- ☐ Light Weight Heaters
- ☐ Direct Fired Heaters

Name _____

Address _____

_____ MS

Skinner Brothers *Engineered* Heating

1450-90 S. Vandeventer, St. Louis, Mo. **New York Office: 1710 Flatiron Bldg.**

Originators of the Unit Method of "Work-Area" Heating

Increase Your Production by Scientific Heating

NO workman can be efficient when his feet are cold. How much time is wasted in your plant on cold days and during early morning hours, *before* the radiators get warmed up? Pecco Unit Heaters have more than five times the efficiency of ordinary direct radiation methods, will heat the working zone much more quickly, occupy small space and cost less to buy, install and operate.

Thousands of these Pecco Heaters are in use, either as regular heating equipment for entire plants or as auxiliary units to heat cold corners, etc. Sign and send us the coupon for complete information concerning this better way to keep your workers comfortable—and profitable.

PECCO, *Incorporated*

2980 North Market Street, St. Louis

Please send me a copy of booklet "Pecco Unit Heaters."

Name .....

Address .....

.....

EMERSON EXHAUST FANS

12 inch
16 inch
18 inch
24 inch
30 inch
and 36 inch.

Every refinement that assures sturdy, powerful, quiet service. Well adapted for unit heater use. Powered with fully enclosed Emerson motors, specially designed for exhaust fan service . . . Ventilating fans and accessories, including louvres, wall boxes and mounting panels. Complete cooperation by Emerson Engineering Department in planning installations.

THE EMERSON ELECTRIC MFG. CO.
2018 Washington Ave., St. Louis
806 W. Washington Blvd., Chicago, Ill.
50 Church St., New York City.

BUILT TO LAST

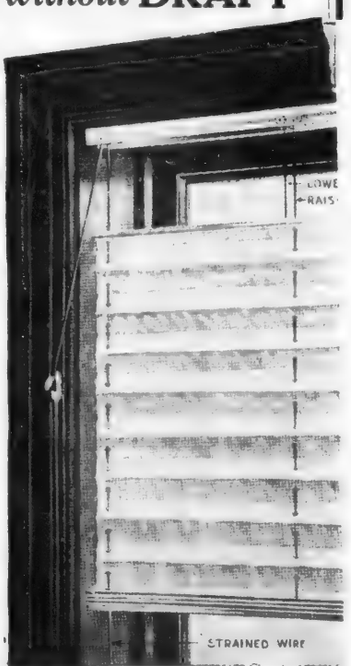
EMERSON MOTORS *and* **FANS**

SUNLIGHT *without* GLARE
FRESH AIR *without* DRAFT

Privacy
without
Gloom
Dignified Beauty
without
Great Expense

ATHEY Window Shades are instantly adjustable to shade any part of the window. They slide on taut guide wires and cannot flap out the window to become soiled or torn.

Ideal for
OFFICE BUILDINGS
BANKS, HOTELS
FACTORIES
SCHOOLS



Athey
PERENNIAL
Window Shades
Weather Strips

Send your specifications or write for complete information and prices.

ATHEY COMPANY
6037 West 65th St.—CHICAGO
New York City: F. H. KEESE, 7 E. 42nd St.
Detroit: W. O. LeSAGE & Co., 410 Donovan Bldg.
Cresswell-McIntosh, Reg'd—420 Seigneurs St., Montreal, Que.

New "Sturdivane"

Patterned after the famous Holland Tunnel Fans

A sturdy, high speed ventilating fan for general use . . . *with the same superior operating characteristics . . . the same low power consumption of the Holland Tunnel Fans.*

MANY months of designing, building and testing—all the facilities of the Sturtevant Research Laboratories—went into the making of the giant Sturtevant fans which ventilate the Holland Vehicular Tunnels.

The result of these months of effort stands as one of the most important achievements in air engineering. Sturtevant not only met the exacting specifications of the tunnel engineers, but met them with a power consumption 15% less than that required by any other competitor.

A new fan, **for general use,** the **"Sturdivane,"** is now offered by Sturtevant. It is patterned after the Holland Tunnel fans . . . possesses the same superior operating characteristics . . . the same low power consumption.

The "Sturdivane" brings new efficiency and economy to ventilating fan operation. Here are some of its outstanding features:

1. Quiet as a slow speed fan.
2. Extremely low cut-off velocity; a larger air outlet allows the air to move quietly at a lower velocity.
3. Objectionable motor noise avoided; wheels can be overhung on extended motor shaft, making a self-contained motor - driven unit which may be set on a silencing frame.
4. Has a self-limiting horse power characteristic; prevents motor overload, and permits use of smaller motors.
5. Cuts operating costs 25 to 30%.
6. Low initial cost.
7. Low transportation cost.
8. Low installation cost; no pulley, belting or chain drive to install when direct connected.
9. Ball bearing equipped; smooth operation—practically no bearing wear.
10. Cuts motor costs; saves 20% or more on direct connected motor costs.

Write, now, for complete information about this important development in ventilating equipment. The nearest Sturtevant office will give prompt attention to your inquiry.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

Atlanta	Buffalo	Chicago	Dallas	Hartford	Kansas City	Washington	Pittsburgh	St. Louis
Birmingham	Camden	Cincinnati	Denver	Toronto	Los Angeles	Montreal	Portland	San Francisco
Boston	Charlotte	Cleveland	Detroit	Indianapolis	Minneapolis	New York	Rochester	Seattle

Sturtevant

REG. U. S. PAT. OFF.

VENTILATING, HEATING, AND POWER PLANT EQUIPMENT

New—42" Disc Pressure Fan

De Bothezat Impeller Company announces a new addition to its line—a 42" Disc Pressure Fan.

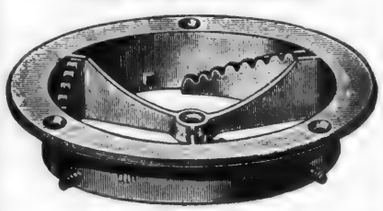
Exceptionally high performance and quiet operation.

Static Pressure up to 1". Air volume up to 22,000 c.f.m.

Particulars on Request

De Bothezat Impeller Co., Inc.
1922 Park Avenue New York City

View of Bottom Casting



Nu-Notch
REG. U.S. PAT. OFF.

THE
Mushroom Ventilator You Can Depend Upon
FOR ANY KIND OF FLOOR

"Nu-Notch" can be installed complete just before the seats are placed, thus doing away with breakage. Attached to

Wood Floors by 3 lag screws in flange countersunk holes.

Concrete Floors by 3 L lugs bolted to floor flange.

Monolithic or similar type of floors, by 3 set screws securing the collar to the sleeve.

"Nu-Notch" is specified by leading architects and engineers. Send for details.

Knowles Mushroom Ventilator Co.
202 Franklin Street NEW YORK CITY

The Herman Nelson hiJet Unit Heater
With
The Wedge Core RADIATOR

Leak-proof, rust-proof, indestructible. Lower installation cost, smaller pipe lines, no reducing valves necessary. Never requires service. Freezing cannot harm it. Operating steam pressure from 1 to 150 lbs. Can be suspended from pipe lines or moved from place to place. Long range heat distribution. The ideal heating unit for

Factories · Mills · Railroad Shops · Roundhouses
Warehouses · Garages · Gymnasiums · Auditoriums

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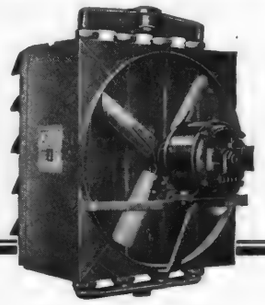
THE HERMAN NELSON CORPORATION
MOLINE *Makers of the* ILLINOIS
UNIVENT *and the* HERMAN NELSON INVISIBLE RADIATOR

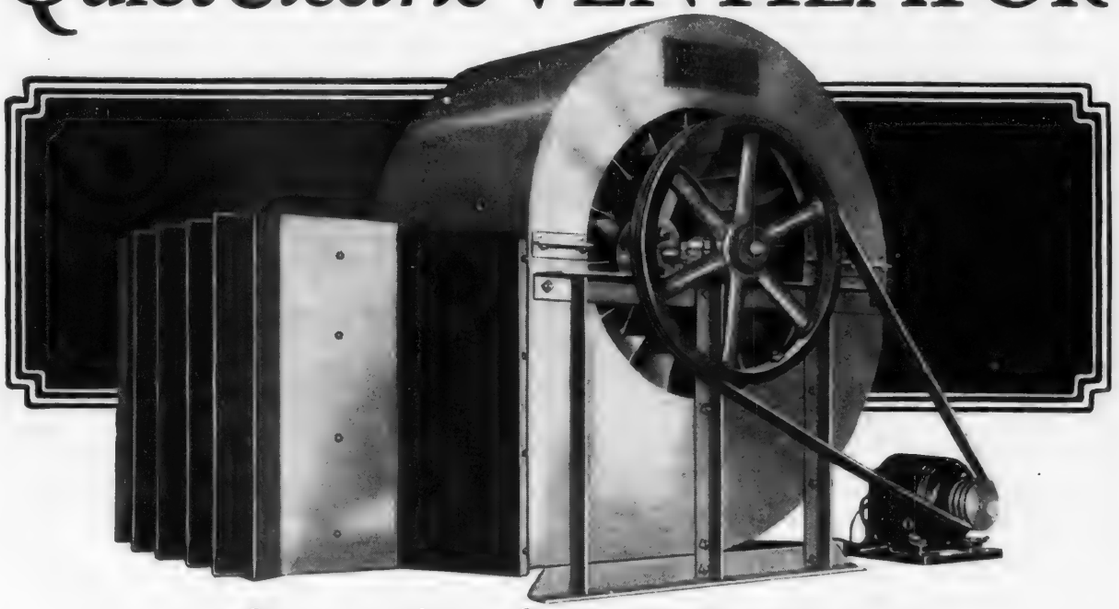


Write for your copy of the Herman Nelson hiJet Unit Heater catalogue

Outdoor Air Indoors

Lakeside

Quiet *Electric* VENTILATOR



Announcing the NEW "TYPE L-1"

Equipped with Four-way Air Deflector

Designed especially to meet the requirements of ventilating engineers for an electric ventilator that is highly efficient and quiet in operation which deflects fresh, outside air in any direction, desired, and is remarkably low in operating cost.

Thirty-two individual blades furnish the maximum volume of air and nine adjustable deflector blades [4 horizontal and 5 vertical] control the direction of the air current.

Equipped with self-aligning SKF Bearings throughout, especially designed impeller, and silent Tex-rope Drive which insures quiet operation and permits compact installation. ¾ h. p. variable speed motor.

WRITE FOR SPECIFICATIONS AND CATALOG of the complete line of Lakeside Quiet Electric Ventilators which meets practically every requirement for installations of this type.

Easy to Install

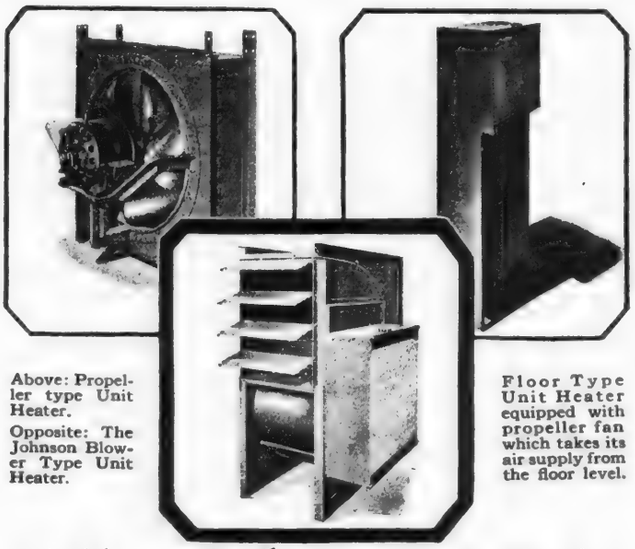
The Lakeside comes ready for installation. It requires no tearing down of walls or ripping up of floors. It is so compact that it fits into a very small space. It can be disassembled to move through small door openings, and installed satisfactorily in many places where it is impossible to install other types of ventilating systems.

VENTILATING IXL SYSTEM

Low Priced
Low Cost of Operation

The Lakeside is very low priced, yet is remarkably efficient and is guaranteed to give satisfactory results. It is very inexpensive to operate and must "make good" in actual service because it is backed by a reliable guarantee. Lakeside Ventilators are easy to operate—and trouble free.

LAKESIDE COMPANY, 105 Main Street, Hermansville, Mich.



Above: Propeller type Unit Heater.

Opposite: The Johnson Blower Type Unit Heater.

Floor Type Unit Heater equipped with propeller fan which takes its air supply from the floor level.

All unit heater needs

are met by this broad line

THE Johnson line of unit heaters is a line on which the contractor can safely *standardize*. Every Johnson installation can be made an ideal installation because there is a Johnson Unit Heater for each specific requirement. Of few other lines can this be so definitely said.

In considering unit heaters, remember that the first high velocity ceiling type heater ever built was a Johnson, and that much of the present popularity of this type is a direct result of the pioneering steps carried out in the Johnson plant. Whatever type of Unit heater is required—blower type or propeller type; for either floor or suspended installation—you will find it in its highest development in the Johnson line. All have the light copper type radiator which permits a higher rate of condensation than any other. All possess the uncompromised quality on which the Johnson reputation is founded.

Let us show you why it pays to concentrate on the Johnson line

JOHNSON FAN & BLOWER COMPANY
1325 W. Lake St., Chicago

JOHNSON

-the pioneer high velocity

Unit Heater

Enflo Diffuser

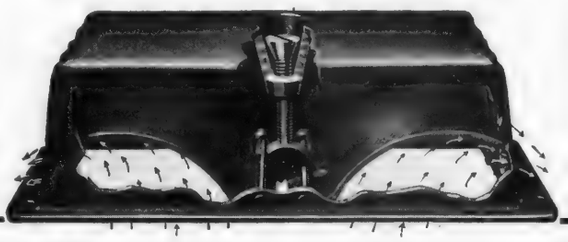
Fresh Air—Without Drafts

There is only one proper method of ventilating a room—and that is without drafts. This is a difficult task, but is easily and efficiently met by the use of Enflo Diffusers. Air is admitted with greater velocity and a constant flow of fresh air maintained without annoyance to those in the immediate vicinity.

The screw in the center of top regulates the amount of air delivered. The Enflo is made completely of cast iron, which will withstand unusual wear and abuse, and there are no parts connected with the Enflo that may become loose or rattle. Easy to install and economical because there are no replacements.

Write for illustrated catalog

VENTILATING PRODUCTS CO.
2800 Cottage Grove Ave., Chicago, Ill.



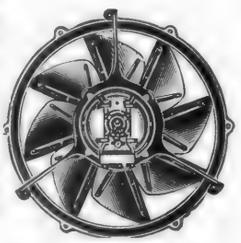
JAMES M. SEYMOUR

Established 1888

Lawrence St., Mechanic St. and Kirk Place, NEWARK, NEW JERSEY

AUDITORIUM FANS, 36″ to 120″ to fit any square opening. SEYMOUR FANS sold subject to substantial discount. Furnished with suitable pulley or coupling for direct connection TWIN FANS include shafting and center bearing.

Special Fans for Cooling Towers, Heating Systems, Induced Draft, Forced Draft, Dry Rooms, Dry Kilns.

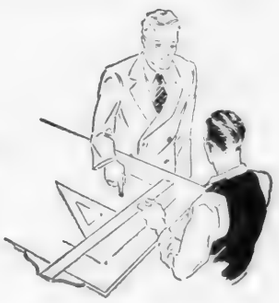


SEND for BULLETINS, PRICES, and DISCOUNTS

The Raymond Weather Compensator used in conjunction with a room thermostat controls the heating system automatically in response to the three variables of room temperature, outdoor temperature, and boiler temperature. Write for details.

F. I. Raymond, River Forest, Illinois.

This is Our Idea of an Efficient Indirect Heater —do you agree with us?



—***uniform pipes:*** of precisely the same length and built in precisely the same way.

—***no short circuits:*** flow of steam, air and water always in one direction; no opposing counter currents. Circulation being free and positive every square foot is prime heating surface.

—***expansion:*** no racking by expansion and contraction each pipe being separate and independent. No rigid connections, return bends, nipples or elbows to be racked out of shape.

—***connections:*** steam and drip connections very simple. No double decking with double steam and return connections required to obtain necessary heating area.

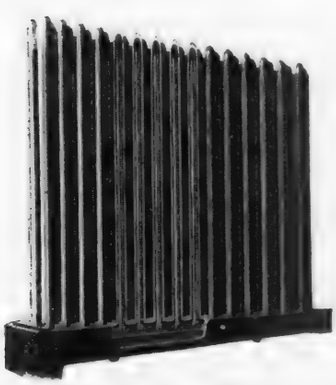
—***ample steam supply:*** operates efficiently on either low or high pressure.

—***efficient regardless of position*** — base horizontal, pipes vertical or pipes horizontal base vertical, or base and pipes flat.

—***all pipes wrought steel*** — rust and corrosion proof.

—***can be shipped knocked down*** — eliminating handling and erecting of heavy, bulky units.

Bayley Chinook Heater—the most improved form of indirect Heater. Construction is such that there are no return bends, elbows or nipples. Permits use of steam at either high or low pressure.



That briefly is the Bayley concept of an efficient indirect heater and the manner in which the Bayley Chinook Heater is built. Many installations have proven it successful. May we tell you where they are and state the argument more fully by means of our Bulletin No. 30?

BAYLEY BLOWER COMPANY
742 Greenbush Avenue Milwaukee, Wisconsin

Bayley

AIR ENGINEERING & EQUIPMENT

HEATING AND VENTILATING
AIR WASHING AND HUMIDIFYING SYSTEMS
MILL EXHAUSTERS — PRESSURE BLOWERS
MECHANICAL DRAFT FANS
AIR AND GAS SCRUBBERS
INDUSTRIAL DRYING SYSTEMS

SPRACO Filter Cell.

Air Filters

that clean properly because they are built on the right principle

Cleaning the air of dust, dirt and foreign matter is simple enough with the right equipment.

Spraco Air Filters do this most efficiently and economically because of the following reasons: The filter media provides the greatest possible dust collecting surface within a given space, and is arranged so as to change abruptly and continuously the small streams of air passing through it. It consists of a stack of expanded metal sheets arranged from coarse to fine in direction of air flow. It is made adhesive by dipping or charging the cell with a special solution called "Dustix." *Air cannot pass through this media without being effectively cleaned.*

The progressive arrangement of the media from coarse to fine mesh insures high cleaning efficiency with minimum obstruction to air flow.

The use of sectional framework is another important advantage of Spraco Air Filters. It eliminates air leakage, insures perfect alignment and greater strength and rigidity, and low cost of erection. Each section accommodates several cells and can be made to fit the space available. All metal construction.

Consult us about your air filtering, conditioning, washing and cooling problems. Ask for Bulletin F-81.

SPRAY ENGINEERING CO.

60 High Street, Boston, Mass.

Cooling Ponds
Spray Nozzles
Strainers
Park Sprinklers

Air Filters
Air Washers
Air Coolers
Flow Meters

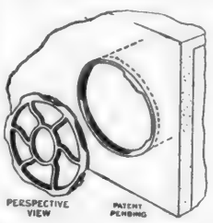
ENGINEERS *and* TRADE MARK MANUFACTURERS

SPRACO BOSTON

Cable Address: "SPRACO," Boston; Western Union Code

for gallery risers USE Round shaped Vents

Write for convincing proof that DISC-LOC, the round shaped vent, is cheaper and easier to install than oblong step grills. Also more practical from the standpoint of structural strength.

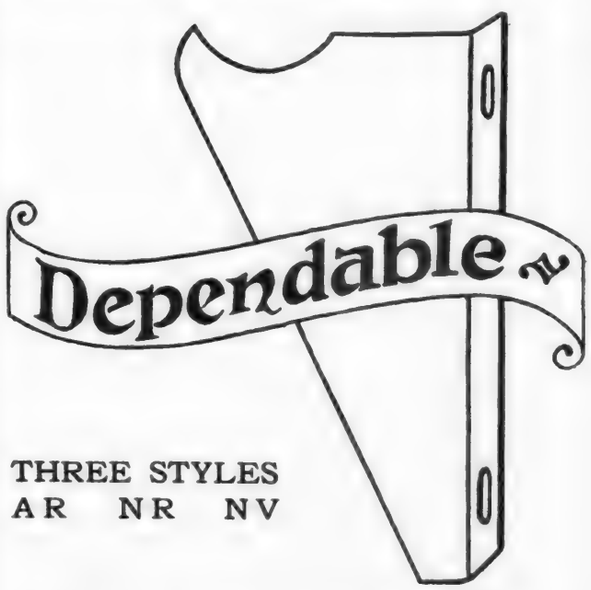


Used by the Newest Theatres in many cities. Architects favor DISC-LOC vents whenever they have been tried. Made with or without dampers.

KNOWLES MUSHROOM VENTILATOR CO.

202 Franklin St., NEW YORK

HARTMANN RADIATOR BRACKETS



THREE STYLES
AR NR NV

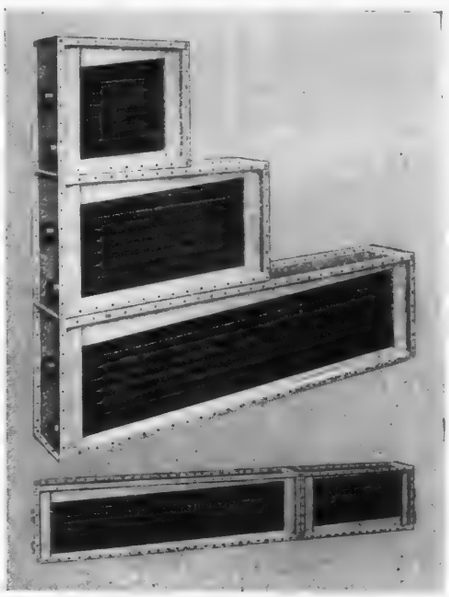
Write for Descriptive Circular and Price List

CHARLES HARTMANN CO.

997-593 Dean Street **BROOKLYN, N. Y.**

No joints to leak with the new YORK SUPER-FIN

1. No joints to leak—*fused metal bond.*
2. For high or low pressure.
3. A high-pressure heating surface at low-pressure prices.
4. Expansion and contraction strain between tube and header positively eliminated.
5. Supply and return at same end.
6. Units can be set end to end.



7. Copper tube with copper fins permanently bonded. No solder or tin.
8. Smooth fins. (Minimize dirt collection.)
9. Tested to 1000 pounds hydrostatic pressure.
10. Built for 1, 2, 3 and 4 nominal depths of pipe in one casing.
11. Casings 12″ thick, either 23″ or 35″ high, in several lengths.

THIS ONE FEATURE—*no joints to leak*—makes the York Super-Fin OUTSTANDING. The tubes become one with the header by a fused metal bond. It totally eliminates a drawback against which this type of radiation has until now had to contend. Not only that, the York Super-Fin operates with either high or low steam pressure—and can be bought at low-pressure prices.

YORK SUPER-FIN RADIATION

The high engineering efficiency of York products is so well established that this new York Super-Fin is being accepted by contractors and engineers with whole-hearted approval. Write for information to York Heating & Ventilating Corp'n, 1506 Locust St., Philadelphia.

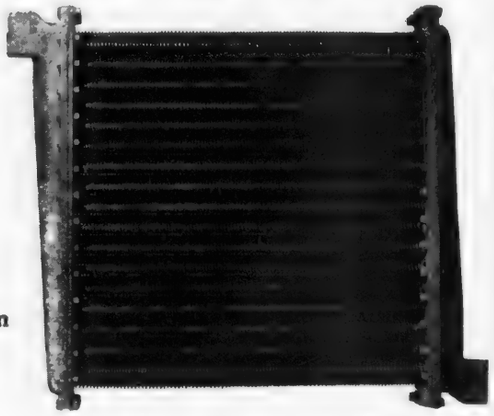
YORK HEATING & VENTILATING CORPORATION

PHILADELPHIA

Engineered Products

Manufacturers of the Famous York Heat-Diffusing Unit

HELICALFIN



Seamless Copper Construction

EXTENDED SURFACE RADIATION

Meets the Demands of Modern Heating and Ventilating Progress

For Permanence and High Efficiency Specify

Rome Helicalfin Tubing

Helicalfin Heater Units and Radiators offer great advantages in high efficiency. The cores consist of tubes and headers made of copper and brass. They are sturdy, compact, light in weight, and last indefinitely with practically no corrosion.

Helicalfin Heater Units and Radiators are the ideal heating equipment for Homes, Schools, Institutions and Industrial Plants.

Rome Helicalfin Radiation has from five to nine times radiating surface of plain tube with proportionate increase in efficiency.

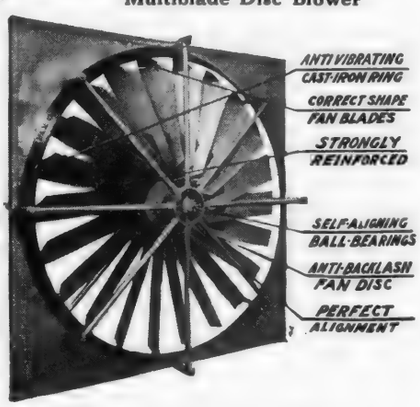
Engineering data covering the performance of Rome HELICALFIN Heaters has been prepared by a nationally known test engineer and is available upon request.

Makers of Good Radiators since 1905

ROME-TURNEY RADIATOR COMPANY
ROME, N. Y.

TYPHOON

Multiblade Disc Blower



Disc Blowers
Centrifugal Blowers
Belt-driven Direct-connected
Unit Drive Fans
Unit Heaters
Ventilating Systems
Air Conditioning Systems

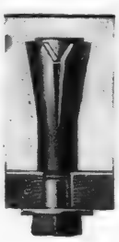
Typhoon Products and Typhoon Systems have been installed all over the country and all over the world. Typhoon is an international standard of efficiency for cooling, heating, and ventilating systems.

TYPHOON FAN COMPANY
345 West 39th Street
New York City
Dealers' and engineers' inquiries invited

CONTROL THE SPEED
OF YOUR VENTILATING EQUIPMENT!
REGULATE WARM AND COLD AIR VOLUME
WITH THE TIME TESTED
HORTON
VARIABLE SPEED
PULLEY

HORTON MANUFACTURING COMPANY
3008-3016 University Avenue S.E. Minneapolis, Minn.
MINNEAPOLIS REFERENCES
Morgan-Gerrish Co. Richardson-Boynton Co. Herman Cook Co.
American Foundry & Furnace Co. St Paul

PHILLIPS Self-Drilling Expansion Shells



A quick and permanent fastening in concrete walls, ceilings, floors, beams and columns. Have internal U. S. Standard threads for rods, bolts and screws. No drills required. Quickly installed by hand or with Phillips Spring Hammer.

Phillips Drill Company
1537 Cortland St., Chicago

Armstrong Trap draining heating unit of a typical forced air heating and ventilating system.

Heater units kept hot With Armstrong *traps*

THE efficiency of a fan heating system depends largely upon the efficiency of heat transmission from the coils to the circulating air. If these coils are clogged with water and air, no degree of steam pressure and temperature will help the situation.

Air and water must be removed from the heater coils before steam can enter and give the proper heating effect. There is no better way of draining the condensate than with Armstrong Traps. They not only drain the water, but are self scrubbing and non air-binding. Furthermore, their operation is independent of the temperatures of the condensate and steam, or the pressure in the line. Armstrong performance, therefore, is always the same. The fact that Armstrong Traps are always water sealed against the escape of live steam is an important economical consideration.

These unique characteristics of Armstrong Traps are due to the inverted bucket construction. This in conjunction with the system of compound levers makes possible the unusually small size for a given capacity. Installations with Armstrong Traps are neat and simple, and because of the wear resisting heat treated chrome steel valves and seats, years of trouble-free service is obtained.

ARMSTRONG MACHINE WORKS

346 Maple Street Three Rivers, Michigan

District Representatives in 36 Cities

H & V 3-Gray

"AFCO" VENTILATING SPECIALTIES

Baseboard Grille
K-515S
(Patented)

Particularly Adapted to School Ventilation

"Afco" Baseboard Grilles K-515S are installed so as to receive air from a duct below the floor or from between the joists, and to divert it upward at a rather high velocity through the slots in the grille to produce a mild whirling of the air in the room.

Radiators may be installed over the grille, thus greatly increasing the heat convection from the radiator.

Down draft due to wall chill is neutralized. Grilles made in any length, with open or closed ends.

Let us send our fully illustrated catalog covering the following "AFCO" products:

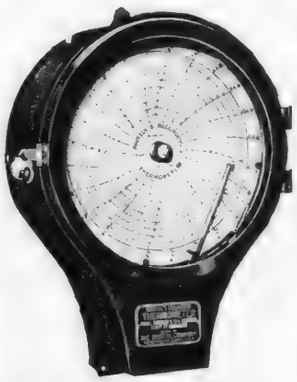
Access Doors
Belt Guards
Blow-off Basins
Dampers (all types)
Diffusers (Floor, Wall and Ceiling)
Expanded Metal Screens
Foot Warmers
Floor Inlets
Flue Fixtures
Grilles (all types)
Heat Hustlers
Handhole Plates
Louvres (all types)
Letters (Aluminum)
Radiator Brackets
Vent Elbows and Frames
Ventilators (Roof)

The American Foundry and Furnace Co.

BLOOMINGTON ILLINOIS

Representatives in principal cities

A running story of heating system efficiency — *told by* BRISTOL'S RECORDING THERMOMETERS



Bristol's Original Form Recording Thermometer. Uses 8-inch and 12-inch Charts.

Placed at strategic points about your buildings they provide permanent chart records of temperatures maintained — a graphic story of conditions prevailing during every moment of the day and night. Thus should any question arise concerning what temperatures were held at such and such a time it is a very simple matter to refer to the Thermometer chart.

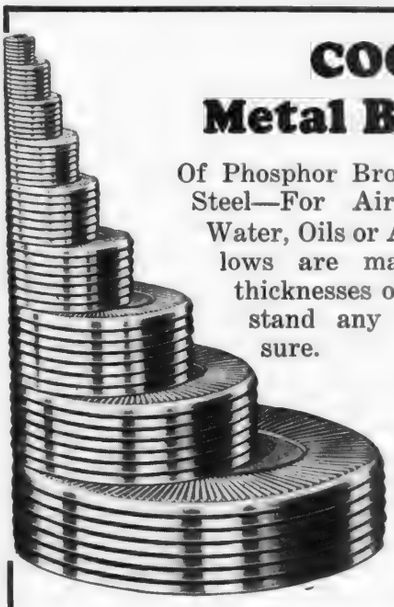
Such records also render a valuable service by pointing out where existing conditions can be improved.

Bristol's Thermometers can be furnished in desired ranges, from — 60° to + 1000° F., and in models to suit requirements. They are rugged, and require very little care.

Write for Complete information

The Bristol Company

Waterbury, Connecticut



COOK Metal Bellows

Of Phosphor Bronze, Monel and Steel—For Air, Gas, Steam, Water, Oils or Acids. Cook Bellows are made of various thicknesses of metal to withstand any practical pressure.

Cook Bellows are made with a joint of unique and new design, and are produced by a new process. Made in several sizes and to any length.

A uniformly high grade product at a comparatively low cost.

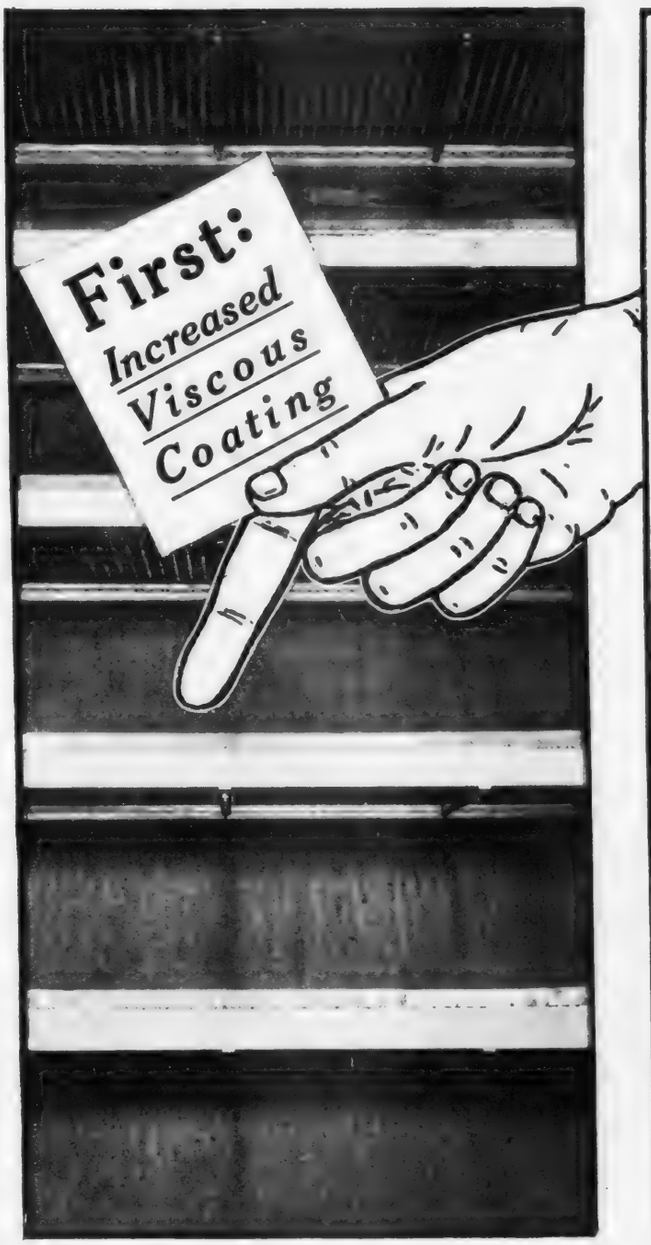
Our engineers will be glad to discuss the adaptability of the Cook bellows to your particular device.

COOK ELECTRIC COMPANY

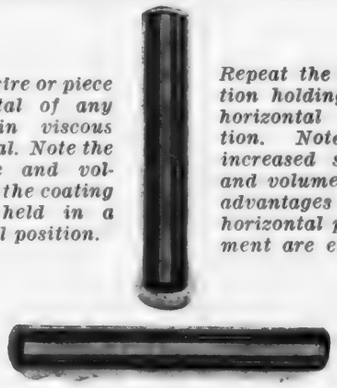
2700 Southport Ave., CHICAGO

THE INHERENT ADVANTAGES OF HORIZONTAL PLACEMENT

As Incorporated in the Midwest Self-Cleaning Horizontal Air Filter Model "H"



Dip a wire or piece of metal of any kind in viscous material. Note the surface and volume of the coating when held in a vertical position.



Repeat the operation holding in a horizontal position. Note the increased surface and volume. The advantages of horizontal placement are evident.

The Remarkable Efficiency of the

MIDWEST

Horizontal Model "H"

is due in part to thick viscous coatings retained throughout the filter medium. Capacity is increased; frequent cleaning and charging in the case of ordinary dust concentrations are not necessary, and where continuous operation is desired, the volume and concentration of dust that can be handled are greatly in excess of anything yet accomplished by metal air filters.

MIDWEST AIR FILTERS

INCORPORATED

BRADFORD, PA.

Offices in Principal Cities

OIL BURNER GULF COMPANY

Makes Profit for Dealers

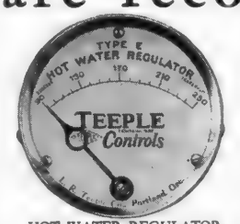
WHEN a dealer secures the Gulf Oil Burner Franchise, he has a valuable and sound merchandising proposition —sound because of years of proved good selling—sound because of the excellent performance given by Gulf Oil Burners in all types of heating plants—sound because the Gulf Oil Burner has behind it the engineering knowledge, manufacturing skill and merchandising ability of the Gulf Organization.

This valuable franchise, including unusual co-operation and sales helps, is still available to a small number of dealers whose qualifications meet our requirements.

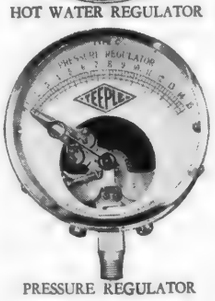
Write now for full details.

The Gulf Oil Burner Co.
Dept. D-3, 1627 Chestnut Street, Philadelphia, Pa.

Are You Satisfied with the controls you are recommending?



HOT WATER REGULATOR

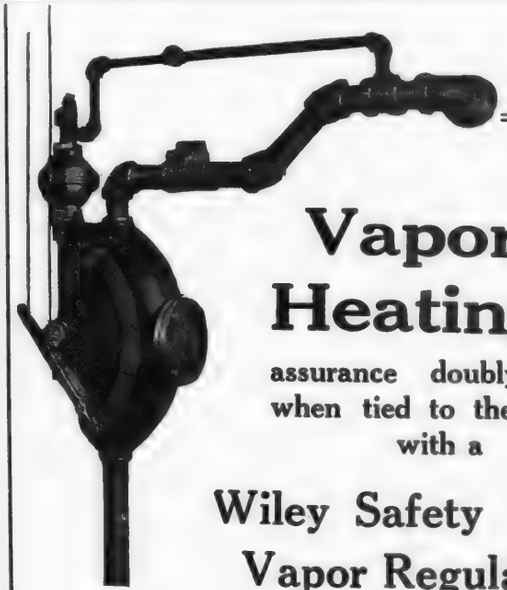

PRESSURE REGULATOR

TEEPLE Temperature Controls combine the most advanced design with skilled workmanship. They meet every problem of heat control for gas furnaces and boilers; unit heaters; refrigerating plants; ovens; furnaces; and automatic coal and oil burners. You can recommend them wholeheartedly.

You'll want this new Catalog . . .
Our latest Catalog fully illustrates and describes the full line of Teeple Controls. Write for it.

L. R. TEEPLE CO., Portland, Oregon

TEEPLE
TEMPERATURE
TEEPLE *Controls*
for GAS — STEAM — WATER — AIR



Vapor Heating

assurance doubly sure when tied to the boiler with a

Wiley Safety Vent Vapor Regulator

Write for your copy of booklet describing the Wiley line of vapor heating specialties.

peerless quality product manufactured and sold exclusively by

The Simplex Heating Specialty Co.
(INC.)
Lynchburg, - Va.

THE Reed Streamline Automatic Air Filter has now been in actual service more than two years. During this time there has been no change in basic principle. The streamline baffle and the self-flushing system developed by Reed engineers remain today as on the first Streamline. Striking confirmation of proficiency and thoroughness in the development and testing of Reed equipment before releasing it for service.

Complete elimination of the oil-distributor pipe-brackets now facilitates the connection of duct-work and permits faster, easier installation.

ANOTHER STEP FORWARD!

A recent refinement in the Reed Streamline Air Filter is the complete elimination of the oil-distributor pipe-brackets. This facilitates the connection of duct-work to the air intake side of the filter, permits faster, easier installation and still further simplifies the most efficient, dependable and fool-proof automatic filter yet developed. No mechanical movement. No sliding mechanisms. No chains, sprockets, gears or conveyors. Nothing moves but the charging liquid—and that for only two minutes a day. *Write for full information today.*

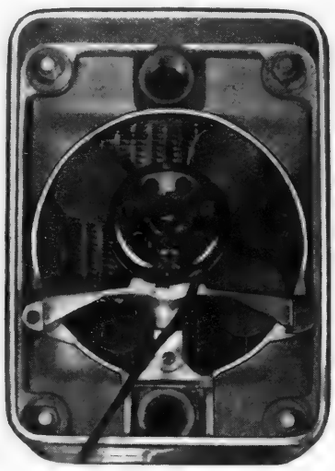
REED AIR FILTER CO.
Incorporated
218 Central Ave., Louisville, Ky.
Representatives in Principal Cities

Reed Air
TRADE *filters* MARK
ALL METAL

McQUAY UNIT HEATERS

For Steam or Hot Water Heating Systems

Equivalent of 50-80 square feet of Direct Radiation



The unit shown here is the smallest of a complete line of eight sizes

It is no longer a question of Unit Heaters, but rather a question of the RIGHT Unit Heater.

McQuay construction overcomes the hazard of leakage with the patented "Lock Seam" tubing, an outstanding McQuay development. No chance for seam separation or blowouts. Tubes are heavy brass, tinned inside, a treatment that resists corrosion and rust under all conditions.

The manner in which the motor is supported is exclusive. No vibration, rattle or noise. Note that the airstream is not impeded in any way.

Each Unit Heater is factory tested under 100-pound Steam Pressure or 200-pounds Hydrostatic, many times greater than the heater will be subjected to under ordinary use. Light, compact, large capacity and virtually indestructible. ***Let us send Full Details.***

McQUAY RADIATOR CORPORATION

General Sales Offices: PURE OIL BUILDING, CHICAGO

Branches in Principal Cities

BAKER Automatic Oil BURNER

MEMBER OIL HEATING INSTITUTE

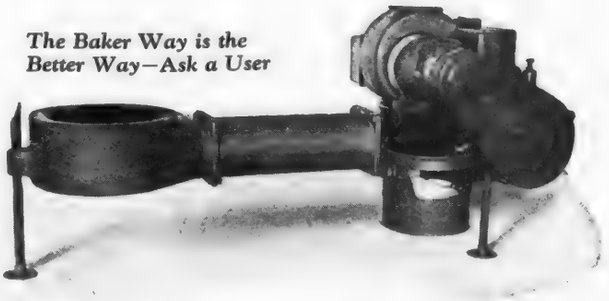
The Most Valuable Franchise a Dealer Can Get

Now we begin the eighth successful year for *Baker Automatic Oil Burners.* Exclusive basic patents gives the "BAKER" its quality leadership and makes it a most desirable and most profitable oil burner dealership you can find.

A smooth, quiet, automatic and perfect oil burner—filled with unassailable talking points and a performance record that makes every user a booster. When you sell and install a "BAKER" you sell and install heating satisfaction.

Write for attractive new dealer proposition and full information

The Baker Way is the Better Way—Ask a User



The Baker Steam Motor Car & Manufacturing Co.

Pueblo, Colorado

Placing
Manufactured Weather*
within the reach of
all Industries

**It isn't Manufactured Weather unless it's a Carrier System.*

Announcing
The Carrier
Unit Air Conditioner

THE *Carrier Unit Air Conditioner* humidifies the air, washes the air, heats or cools the air and produces uniform controllable air circulation. ***The Unit*** automatically creates and controls conditions of Temperature and Humidity to suit the manufacturing process. ***The Unit*** is compact, it occupies less than half the space of an ordinary office desk. ***The Unit*** requires only simple water, steam and electrical connections to prepare it for operation. The Unit is operated by a single motor at an overall efficiency never before approached in air conditioning equipment. ***The Unit*** is sold at an exceedingly low price. A single Unit will meet all of the requirements in the average work-room of 25,000 cubic feet. ***Three Units*** will condition a large work-room.

HERE is the most revolutionary step ever taken in the science of Air Conditioning.

¶ Carrier Engineers, the pioneers and leaders in the design, development and application of systems to create and control any desired atmospheric conditions within buildings, have now perfected ***The Carrier Unit Air Conditioner.***

¶ This Unit performs every function of the complete Carrier Central Station Air Conditioning Systems which for 25 years have been making "Every day a ***good*** day" in many of the great industrial plants of the world. The Unit is not a miniature humidifier copied from the standard central station equipment, but a completely novel design developed under the direction of Willis H. Carrier to place Manufactured Weather within the means of ***any*** manufacturer.

¶ There is an economic margin which directs whether the Carrier Unit Air Conditioner or the Carrier Central Station System shall be used in manufacturing plants. Upon request Carrier Engineers will present all of the facts, without obligation, to manufacturers.

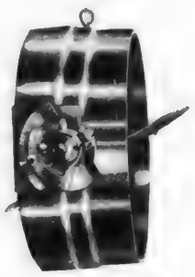
Every Manufacturer, large or small, every Engineer should obtain immediately the full details of the Carrier Unit Air Conditioner. Write for Bulletin 103, *The Carrier Unit Air Conditioner.* Ask for a visit from one of our engineers.

Carrier Engineering Corporation

Offices and Laboratories
Newark, N. J.

NEW YORK PHILADELPHIA BOSTON CHICAGO CLEVELAND WASHINGTON KANSAS CITY LOS ANGELES

It Adds To Your Profits Subtracts From Your Troubles Costs You Nothing



Oil burner men all over the country are equipping each burner installed with the Preferred 100% Automatic Damper.

Your customers will be glad to buy the Preferred Damper because they save from 10 to 25% on fuel costs.

These Preferred 100% Automatic Dampers eliminate "puff-backs."

They make the burner operate more efficiently.

Save service call expenses and make the added profit the Preferred 100% Automatic Damper offers you.

It costs you nothing for your customer pays for it.

Install them now for old and new customers.

Listed as standard by Underwriters' Laboratories.

Preferred Utilities:

Preferred 100% Automatic Damper
Preferred Foot Valves
Preferred Anti-Syphon Valve
Preferred Double Tapped Bushings
Preferred Flush Boxes
Preferred Vent Protector
Preferred Domestic Hot Water Control Panel

Other Preferred Utilities in our laboratory and on test in the field.

PREFERRED UTILITIES MANUFACTURING CORP.

33 West 60th St., New York, N. Y.

GORTON SYSTEM

Vapor Heating For Apartments

Apartment heating is exacting in its requirements. Occupants *must* be satisfied with the heat received or the owners will soon find themselves without tenants and consequently loss of income.

It is therefore imperative that the heating system be dependable in the coldest weather.

The Gorton Single Pipe Vapor System has proved its dependability in a great number of apartment installations.

And don't forget it *will save 25% in installation cost.*

Write for literature and trade price sheet of Gorton Vapor Specialties.

GORTON HEATING CORPORATION

Formerly **Gorton & Lidgerwood Co.**

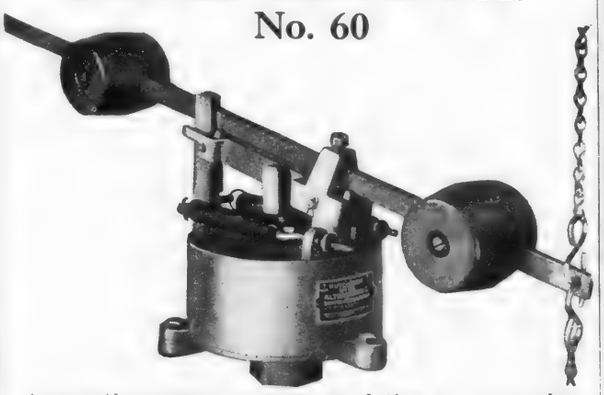
96 Liberty Street, New York, N. Y.

Established 1887

Satisfaction For Your Customers Profits For You In

HUTCHISON

Pressure-Vacuum DAMPER REGULATOR No. 60

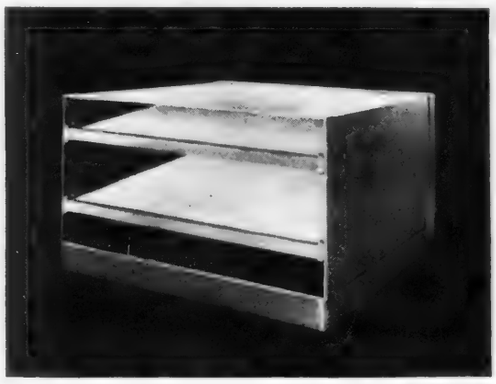


Automatic pressure-vacuum regulation on a one pipe steam system means less cellar trotting and lower fuel bills for your customer. It's as easy to install as any ordinary pressure regulator.

Send for our folder with complete description, and easy-to-follow directions.

Hutchison Regulator Sales Corp.

12 Lispenard Street, New York



The NATIONAL AIRMAT Cabinet Filter

—the Dry Process Air Filter

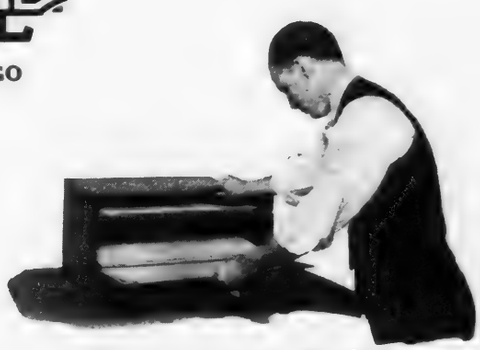
it's new!

National has pioneered again. A distinct new principle in air filtration is now introduced. The AIRMAT paves the way to standards of efficiency and cost previously unknown in commercial air filtration. Ask for new descriptive folder.

NATIONAL AIR FILTER COMPANY

5130 Ravenswood Ave., CHICAGO

Replacing the dirty mat with a clean one—just as easy as changing a blotter on your desk.



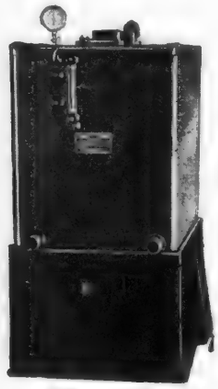
Removing one of the four slides in which the filtering mats are carried in each cabinet. Each mat is 24 in. by 24 in.

H & V 3-Gray

SHOOT PAR

with

BRYAN BOILERS



SPEAKING of Boiler golf—why dub your first shot—use that good club "capacity" and send BRYAN zipping down the fairway for a big advantage — approach that wary prospect with that old stand-by "economy"—dig out of the rough going with "efficiency"—"beauty" is the one to use in getting around a coal boiler stymie—Then! Sink 'er home with your good friend "dependability."

BRYAN Boilers offer the biggest merchandising possibilities of any product in the heating industry. The market has been established and is increasing by leaps and bounds, the BRYAN meets every demand for an ideal boiler for use with Oil or Gas, so why not cash in on this?

Exclusive sales franchises are granted to the heating trade in open territory

BRYAN STEAM CORP.

PERU (Boiler Division) IND.
301 Bryan Building.

BRYAN

MEMBER OIL HEATING INSTITUTE OIL HEAT

BREESE DRAFT REGULATOR

Provides an absolutely steady draft, automatically at all times.

THEREFORE:

It saves fuel
Increases efficiency of fire,
Lengthens the firing period,
Reduces the amount of ashes
Makes a coal fire automatic.
Essential where oil burners are used.
Another development of the BREESE ENGINEERING CORP.
Attractively finished in nickel and two color baked fender enamel.
They sell themselves.

BREESE ENGINEERING CORPORATION

513 W. Jackson Boulevard

CHICAGO ILLINOIS

This improved Portable Combustion Test Set is a simple and convenient case of instruments for service men, combustion engineers, oil burner dealers and others interested in the quick determination of combustion efficiency and the cause and location of boiler trouble.

New Hays Portable Test Set

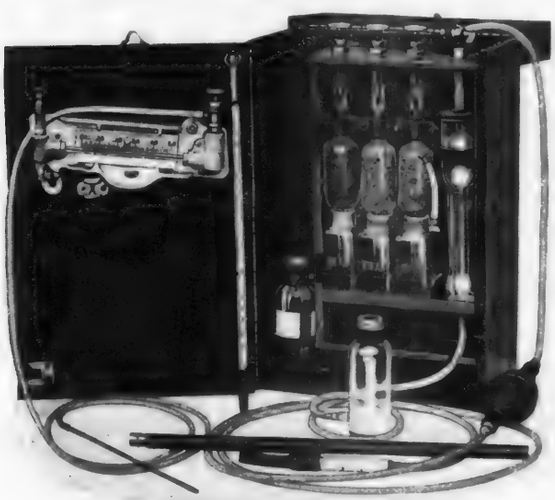
"The Combustion Compass"

See the Hays Portable Test Set in Suite 500, Stevens Hotel, April 3-4-5

The Hays Portable Test Set enclosed in a specially designed carrying case. The case measures only 6½" x 17" and can be slipped into an automobile or underneath the seat of a train. Total weight is less than 20 pounds.

With this Testing Kit it is possible to make a complete flue gas analysis in less than four minutes, to determine draft at various points and temperatures within furnace or in the flue. Service men are able to quickly adjust regulators, dampers, etc., so as to minimize "excess air," maintain high CO_2, reduce stack losses and clear up leaky settings, broken baffles, cracks, etc.

The new Hays Test Set consists of Flue Gas Analyzer, Flue Gas Thermo-Gage and Draft Gage, compactly arranged in an oak carrying case. The Analyzer is the standard Hays Gas Analyzer, either single chamber style for carbon dioxide only, or three-chamber style for carbon dioxide, carbon monoxide and oxygen. A CO_2 test can be made with this instrument in thirty seconds. The Draft Gage is of the Inclined-Tube type with a micrometer screw for leveling. The scale is movable for convenience in setting the zero opposite the end of the oil column, and a needle valve is provided to lock the oil in the oil-well while the set is being transported.



The Hays Portable Test Set ready for use. The use of glass parts made in special moulds on bottle machines and of heavy-walled glass tubing with metal guards gives visible operation without sacrificing strength. No glass comes in contact with metal.

There are many other features which we should be glad to explain. Let us send detailed information.

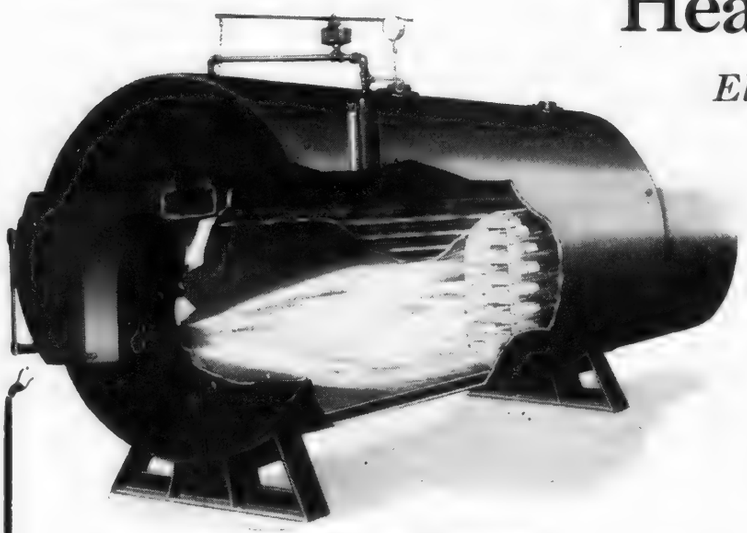
The Hays Corpn.
Michigan City, Indiana

See the Hays Portable Test Set in Suite 500, Stevens Hotel, April 3-4-5

THE RACINE HEATING BOILER

A Modern Scientific Heating Boiler

Electric Arc Welded



Our fifty years' experience and large facilities have been combined to make this Heating Boiler an outstanding improvement in its line. It combines the finest known types of A.S.M.E. construction and materials. Large combustion space, big water capacity and ample steam space give it the highest degree of efficiency and economy. It is smokeless and the rating is guaranteed. The rapid circulation of the water caused by the circulating tube makes the Racine Heating Boiler ideal for hot water as well as steam. It requires low head room and is the easiest boiler to install and to clean. Boiler is a complete unit when shipped from factory—no brick work to be installed by heating contractor.

AN IDEAL OIL BURNER

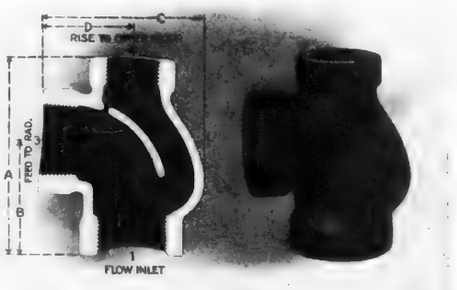
We will equip them for any oil burner made—also equipped for coal burning.

Write for descriptive catalog giving specifications, dimensions and prices of 24 different sizes.

FREEMAN MFG. CO., Dept. H, RACINE, WIS.

Blake Testite O. S. Distributor Fittings

SAVE FITTINGS, LABOR, FUEL—
INCREASE CIRCULATION



For Hot Water Heating Systems and Domestic Hot Water Supply

Perfect Control of the Circulation. No Short Circuiting. The Lip Distributes the Water Evenly

Made in 39 Sizes

Your Jobber Will Furnish Them

BLAKE SPECIALTY COMPANY

ROCK ISLAND, ILLINOIS

The Security Stove & Mfg. Co.
of Kansas City, Mo.

announces

SECURITY OIL BURNER CO. OF NEW YORK

60 BROADWAY, FLUSHING, N. Y.

Exclusive distributors in
New York, New Jersey, Connecticut and Delaware

also

SECURITY SALES CO.

739 BOYLSTON ST., BOSTON, MASS.

Exclusive distributors in New England States

Attractive agency proposition open to dealers

Apply as above or to

SECURITY STOVE & MFG. CO.

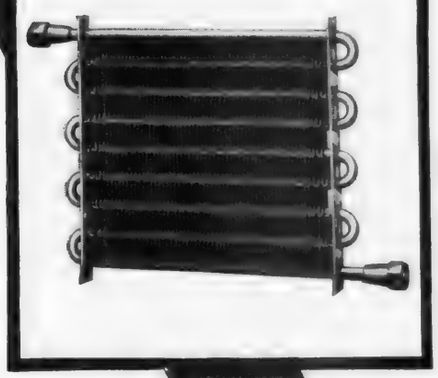
1630 OAKLAND, KANSAS CITY, MO.

Makers of Oil Burners for 18 years

Security Oil and Gas Burners are

NATIONALLY USED PRODUCTS

SOLD FROM COAST TO COAST



for Fan System Heating Units

Here we present the *newest* in *finned tubing coils* for Fan System Heating Units.

This new patented fin allows the coil to be made of one continuous tube, *without joints.* It gives more fin area per inch of tube. It is light-weight but extremely rigid. It can be built to fit housings or cases of any shape or size.

New Sales Features

This construction is so entirely new—so entirely different from the designs of other units in this field—that it affords striking sales advantages for those who adopt it.

Manufacturers in production will be interested in quotations which we will give on receipt of blue prints.

Wolverine Tube Products

Seamless Copper, Brass and Aluminum Tubing

Soldering Lugs

Starting Cable Terminals

Automobile Engine Oil Lines

Condenser Coils for Electric Refrigerators

Finned Tubing, Cores for Fan System Heating Units

and a broad line of parts fabricated from Seamless Tubing.

WOLVERINE TUBE COMPANY
1415 CENTRAL AVENUE DETROIT, MICHIGAN

Sales Offices: ***Atlanta, Ga.,*** 411 Georgia Savings Bank Bldg.; ***Chicago, Ill.,*** 129 S. Jefferson St.; ***Cleveland, O.,*** 602 Hunkin-Conkey Bldg.; ***Dayton, O.,*** 908 Dayton Savings Bank Bldg.; ***Denver, Colo.,*** 1715 California St.; ***Los Angeles, Cal.,*** 224 E. 11th St.; ***Rochester, N. Y.,*** 206 Central Trust Bldg.

WOLVERINE TUBE

SEAMLESS COPPER & BRASS TUBING

Members of Copper & Brass Research Association ***Standard Sizes of Copper Tubing Carried in Stock***

Winslow nozzles adapt Type 800 Kleen Heet to any plant of between 800 and 6,800 square feet load.

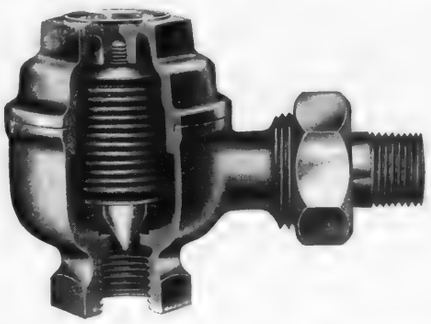
ANNOUNCING several important developments *by* KLEEN-HEET

A NEW and profitable field is opened to heating contractors by the increased efficiency, supreme quiet, and greatly simplified installation of the new Type 800 Kleen Heet. It is designed for heavy duty—is fully automatic—and, by the new series Winslow nozzles, is adapted to *plants* carrying total steam loads of from 800 square feet up to 6,800.

Detailed information, of real value, upon request. Some exclusive franchises are still open.

WINSLOW BOILER & ENGINEERING CO.
844 Rush St., Chicago, Ill.

THE No. 3 THERMOFLEX-HYDRON ANGLE RADIATOR TRAP



The Hydron Bellows is the only **hydraulically formed proof-tested** bellows used in thermostatic radiator traps today. Each and every bellows is subjected to several hundred pounds, internal hydraulic pressure in the making. Weak, uneven, or defective metal **will not** make a Thermoflex-Hydron Bellows. Our new complete catalog No. 52 will be ready for delivery about March first. Gladly mailed upon request.

W. D. CASHIN COMPANY
35 Hartford Street **Boston, Mass.**

Unusual Service Is Always Insured When You Install

POWELL VALVES

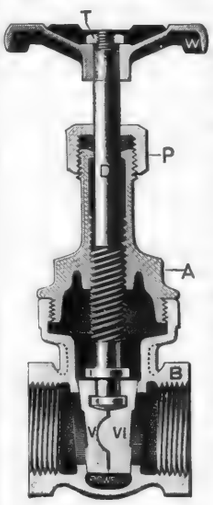


Fig. 500 S. E. Gate Valve

Powell 125 pound Gate Valves are designed for standard pressures with full straight-way openings offering very little if any hindrance to flow through body of valve. These valves are obtainable with screw or flange ends, with rising or non-rising stems. The wedge discs are accurately guided by lugs cast integral which travel in grooves cast in body.

Reinforcing ribs cast in the body shell and additional thickness in the hexagon ends assure strength and safety and relief from undue strains created through expansion or contraction and weight of piping. They can be repacked under pressure when valve is wide open. Sizes ¼ to 3 inches.

Powell Valves are carried in stock by competent dealers everywhere. If your dealer cannot supply you, write to us.

THE WM. POWELL CO.
2521-2531 Spring Grove Ave. **CINCINNATI, O.**

AN ACTUAL PHOTOGRAPH—UNRETOUCHED

Heat Delivered to the Floor 38 Feet Down In 5 Seconds

With a steam pressure of 60 lbs., a room temperature of 50° F., and from an elevation of 38 ft., two Thermal Unit Heaters projected streams of air to the floor of a boiler factory in less than 5 seconds. Smoke bombs held behind the units made it possible to indicate the speed, duration and distance of projection of the air stream.

Details of this test, with a remarkable series of illustrations showing the progress of the air stream at intervals of 5 second periods will be supplied on request.

Thermal Unit efficiency is built around a patented aluminum alloy heating coil, integrally-cast, with a stream-line core. Result—minimum penetration and conduction losses, reduced obstructions to air passage, guaranteed steam pressure resistance up to 250 lbs., exceptional economy.

THERMAL UNIT
INTEGRAL SECTION
MECHANICAL

Send us the details of any problem of heating, cooling and air conditioning and let us submit recommendations —satisfaction guaranteed.

"Put The Air to Work."

Thermal Units Company

A Subsidiary of

Mechanical Manufacturing Co.

Union Stock Yards

CHICAGO, ILL.

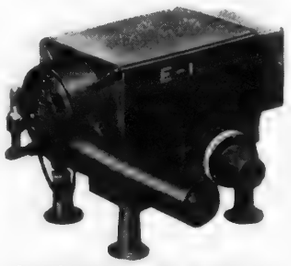
Eastern Office—
30 Church St., New York.

New England Distributors—
Braman, Dow & Co.,
239 Causeway St., Boston, Mass.

IT WILL PAY YOU TO INVESTIGATE THIS BURNER!

Don't let another day by without making yourself acquainted with the Eisler

JUNIOR



RADIATION—250 to 900 Ft.

Made In Three Sizes—Each size has a wide range of adjustments. This insures the proper installation needed.

Each burner is a self-contained unit—controlled by Minneapolis Protectorelay and Protectostat, which are mounted on burner.

Write for Dealer facts at once.
A few desirable franchises still open.

DOMESTIC

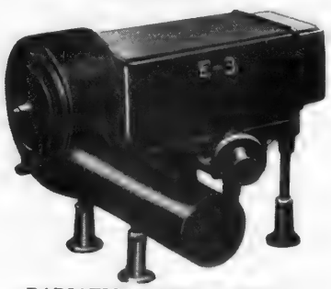
RADIATION—900 to 3000 Ft.

The Eisler is manufactured by a financially strong corporation, which for many years have been successfully manufacturing precision machinery.

Join our ranks for better and bigger business.

The Eisler is hailed by conservative distributers, dealers and engineering authorities as the final word in oil heating equipment. Quiet, efficient, dependable—one of the most compact, rugged and simplified oil burners being sold today—a real success—requiring negligible servicing.

INDUSTRIAL



RADIATION—3000 to 6500 Ft.

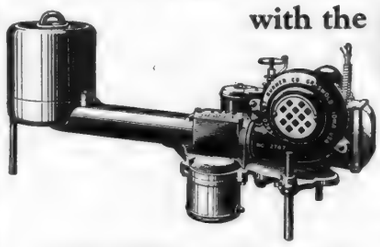
LISTED AS STANDARD BY UNDERWRITERS' LABORATORIES

EISLER AUTOMATIC OIL BURNER

EISLER ENGINEERING CO., OIL BURNER DIVISION, Inc.

764 SOUTH THIRTEENTH STREET, NEWARK, N. J.

It's Time to Line Up with the LACO



If you're planning a real oil burner business for 1928 you'll want to line up *now* with the LACO. Made in five sizes—meets all price competition and is second to none in economy of operation and freedom from bothersome service calls.

GUARANTEED. Write for dealer terms and full particulars.

LACO GAS BURNER CO., Griswold, Iowa.

THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

FOR LOW AND HIGH TEMPERATURES

Our No. 1800 metal for temperatures below 450° F.
Our No. 2600 metal for temperatures below 1500° F.
Other High Heat Metals for special uses.

Positive and Dependable Thermostatic Metals

W. M. CHACE VALVE COMPANY
1600 Beard Avenue
Detroit, Michigan

HOUSE HEATING WITH OIL FUEL

By **P. E. FANSLER,** *Associate Editor, The Heating and Ventilating Magazine*

A representative of one of the largest oil burner manufacturers writes us:

"I have just returned from a trip on the road and find copy of "House Heating With Oil Fuel" which I requested you to mail me here, and I herewith enclose order in payment of same. I have bought all available books published on oil burning during past seven years I have been connected with development work in the field, appointing dealers for oil burners, and there has been nothing yet that approaches this book. Every oil-burner dealer owes it to himself to have a copy. I will advise all of our dealers to get a copy of this book as an absolute essential."

362 PAGES **MORE THAN 150 ILLUSTRATIONS** **PRICE $4.00**

Published by

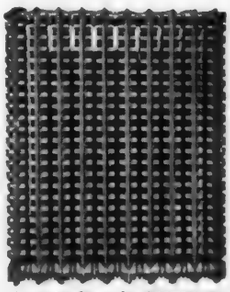
HEATING AND VENTILATING MAGAZINE CO.

386 FOURTH AVENUE **NEW YORK CITY**

VENTO AGAIN!

Montreal's Latest and Largest Office Building Exclusively Equipped with VENTO

The 10,418 square feet of VENTO installed in the Royal Bank of Canada is further indication of the rapidly growing preference for VENTO Cast Iron Heaters. The thousands of installations in our great skyscrapers and modern buildings of all types are convincing proof of VENTO'S superiority. Engineers, architects and building owners find in VENTO the utmost in durability, perfect control and operating efficiency at a decidedly lower initial cost.



A typical stack of VENTO
Cast Iron Heaters

York & Sawyer, New York City
Architect
S. G. Davenport, Montreal, Canada
Ass't. Architect
Meyer Strong & Jones, N. Y. C.
Consulting Engineer
Wilson & Kearn, Montreal, Canada
Ass't. Consulting Engineer
John Colford, Montreal, Canada
Heating Contractor
B. F. Sturtevant Co., Hyde Park, Mass.
Blower Company

ROYAL BANK *of* CANADA
Montreal, Canada

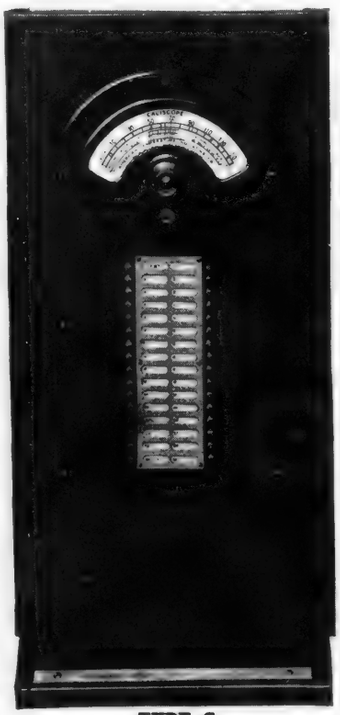
AMERICAN RADIATOR COMPANY

VENTO DEPARTMENT: 816-820 South Michigan Ave., Chicago

Makers of IDEAL Boilers, AMERICAN Radiators, ARCO Tank Heaters, VENTO Ventilating Heaters, AIRID Air Valves, MERCOID Controls and devices for drying, humidifying, cooling and refrigeration.

Showrooms and sales offices: New York, Boston, Providence, New Haven, Newark, Philadelphia, Baltimore, Washington, Richmond, Buffalo, Pittsburgh, Cleveland, Detroit, Cincinnati, Atlanta, Chicago, Milwaukee, Indianapolis, St. Louis, St. Paul, Minneapolis, Omaha, Kansas City, Denver, San Francisco, Los Angeles, Seattle, Toronto, London, Paris, Milan, Brussels, Berlin.

The American System of Temperature Indication



TYPE C

The Caliscope

is an electric device used for the remote indication of both wet and dry bulb temperatures, and without further use of charts or calculation, shows the comfort zones or the correct relation between the temperature and the moisture content of the air for the comfort of the occupants.

It centralizes your control and supplies the intelligence to properly operate the heating, ventilating and refrigerating systems.

ACCURATE and DEPENDABLE

OUR "NEW" SINGLE UNIT

CALISCOPE

TYPE A

The Type A Caliscope is especially adapted for indicating temperatures where only a few elements are required in theatres, offices, public buildings, apartments, factories, cold storage plants and greenhouses.

This instrument is simple to install and guaranteed permanent in calibration.

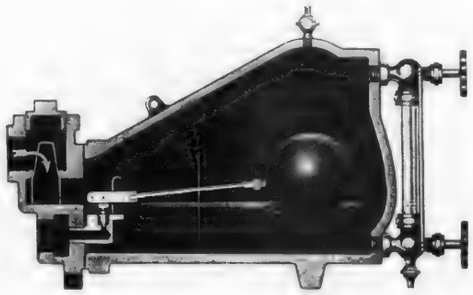
Furnished complete with Thermoscope (dry bulb room element) including wire up to 300 feet.

Price $65.00

The American Temperature Indicating Co.

1017 Summit Street TOLEDO, OHIO

REGISTERED KIELEY TRADE MARK



The New 1928 Issue Catalog No. 57 is Now Ready For Distribution

The Kieley Ball Float Steam Trap is suitable for practically any conditions handling Heating Condensation. Dry Kilns—Blast Coils—Hot Water Heaters and other apparatus should be drained by this type trap. They are particularly well adapted for discharging condensation into vacuum mains.

KIELEY & MUELLER, Inc.

34 West 13th Street New York City

CAPITOL

STA-PAK VALVES

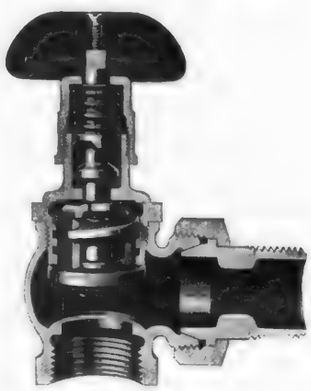
Sta-Pak Valves are high quality valves of the packless type, priced to bring in orders.

Once installed, the STA-PAK requires no further attention. No repacking is ever necessary.

It has a very high lift; one turn of the mushroom handle opens or closes it.

Manufactured of tested materials, STA - PAK Valves are quality products that will appeal to your customer. STA-PAK Valves are offered at attractive prices.

Write or wire for details.



[Michigan Smelting and Refining Co. now operating Capitol Brass Works]

CAPITOL BRASS WORKS

MANUFACTURERS OF BRASS VALVES, BOILER TRIMMINGS AND PLUMBERS' BRASS GOODS

DETROIT, MICH.

The United States Ozone Company

Announces that—

THE Electric Water Sterilizer & Ozone Company of Scottdale, Pa., who formerly manufactured our equipment in accordance with our plans and specifications, passed into bankruptcy during August of 1926. Subsequent operations of the Receivers and Trustees in bankruptcy proved unsatisfactory, necessitating manufacture of the equipment under the direct supervision of our own highly experienced and well-trained staff of engineers and technologists who pioneered the ozone industry in America.

The change has afforded an excellent opportunity for a complete revision of our standard line, without delay in deliveries, together with an additional important development in Radi-ion ionizers for ventilation work. We are now in a position to make deliveries more prompt than ever before in our history.

We wish to add that we have no connection whatsoever with the recently incorporated United States Ozone Company of America, Scottdale, Pa., whose officers are: Pres., E. Ralph Loucks, Banker; Vice. Pres., Robert Norris, Banker; Sec. & Treas., Charles Loucks, Banker.

THE UNITED STATES OZONE COMPANY

GENERAL OFFICES AND LABORATORY

500 N. Dearborn Street,

Chicago, U. S. A.

Fred H. Montgomery
President

Frank E. Hartman
Vice-Pres. & Chief Chemist

W. Ray Montgomery
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Representatives
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Pacific Coast:
Montgomery Brothers,
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KELLY
No. 2 Vacuum Valve

That "KELLY AIR VALVES ALWAYS MAKE WARM FRIENDS" is a well known fact. Why? For the reason, that they are the most effective valves ever designed and manufactured by us.

Simplicity of parts. Absolutely positive in action.

Compare the design of KELLY VALVES with that of other makes.

Every "KELLY" valve is subjected to a practical Steam and Vacuum test before shipping and all valves are GUARANTEED FOR FIVE YEARS.

Be convinced. Greater value for less money.

Prove what we say to your own satisfaction by comparative tests in actual service.

Manufactured by

KELLY BRASS WORKS

General Office and Works

226 W. Ontario Street, Chicago

Represented in most leading cities

The Davis Pressure Regulator is constructed so as to save in upkeep cost as well as in the cost of steam

IS THERE a process, an auxiliary, or a heating system in your plant that is getting more than its share of steam—that is, operating at boiler pressure when a much lower pressure would do this work? A Davis Pressure Regulator can be set to deliver exactly the right amount of steam for any given service—automatically and without regard to high pressure fluctuations. It saves steam.

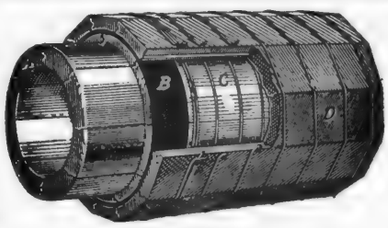
G. M. DAVIS REGULATOR CO.
436 Milwaukee Avenue Chicago, Illinois

DAVIS VALVE SPECIALTIES
STEAM · SAVERS SINCE 1875

VALVE MAKERS FOR OVER FIFTY YEARS

H&V8-Gray

Wyckoff's Improved Cypress Covering



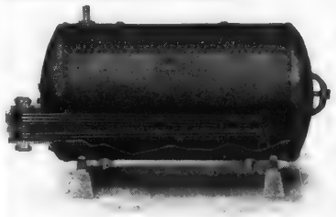
Lasts as Long as The Pipe Itself

As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.

Alberger Buffalo Heaters

are built for a great variety of standard and special operating conditions for heating water with steam or for the interchange of heat from one liquid to another.



Instantaneous Heaters
Storage Heaters
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Coolers
Heat Interchangers

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Typical installations of Mason Regulators

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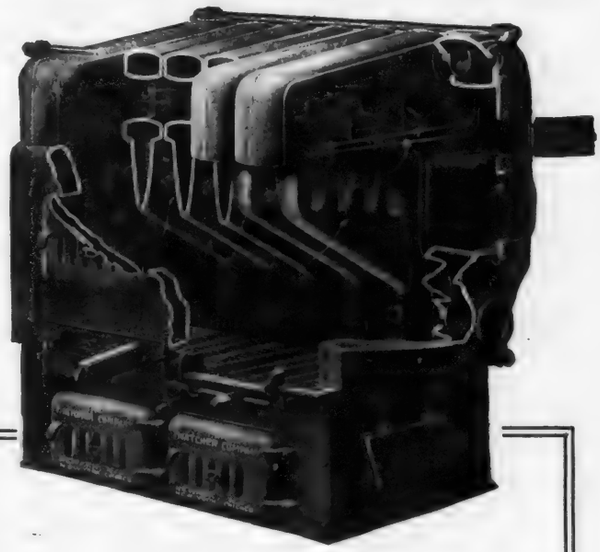
Mason Regulators made money for the contractors who put them in these buildings,—you will find it profitable to include them in the contracts you are now figuring.

Write for a copy of new Catalog No. 62 which gives a complete description and prices of Mason Regulators for every purpose.

Mason Regulators
MASON REGULATOR CO.
Boston, Mass

1600

THATCHER
PROGRESS BOILER



THE Thatcher Progress Boiler, with its "triple fire travel" gives the greatest heating comfort for the fuel consumed. All the flames and gases in the Progress pass three times through the entire length of the boiler before entering the smoke flue.

The low water line (only 55 inches in the largest size) makes the Progress easy to install because no pit is necessary and ample room is assured. Its side-feed construction and short depth of grate make it easy to fire.

Write for trade information and literature about the Thatcher Progress Boiler and other Thatcher products.

THE THATCHER COMPANY
SINCE 1850

NEW YORK	NEWARK, N. J.	CHICAGO
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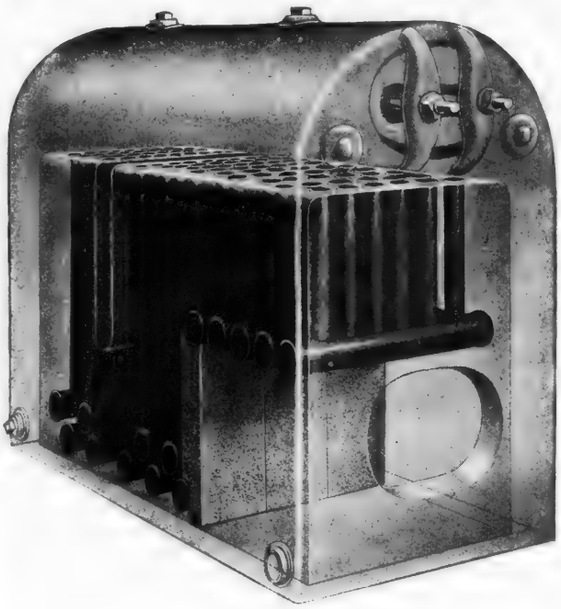
THATCHER
BOILERS-FURNACES-RANGES

JOHNSTON

Electric Welded

Steel Heating Boiler



OIL BURNER TYPE

EFFICIENT. Not only in the laboratory but on the job. Efficient when new and the same efficiency after years of continual service.

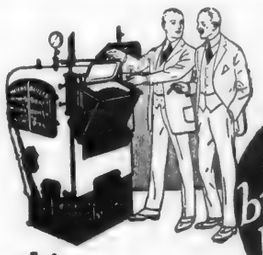
SUBSTANTIAL. Because made of steel. Heavy thicknesses welded into one single unit. No cracking. No leaking.

HIGH QUALITY. Intended for the man who wants the best. Who knows that the slightly higher first cost is soon saved by superior performance and who realizes that such saving is returned to him year after year.

LOWEST FUEL COST can only be obtained in a boiler designed and built expressly for oil burner service.

Johnston Brothers, Inc.

Ferrysburg, Michigan



NO FORCED DRAFT

burns No. 1 Buckwheat

Breaking the Record for Low Coal Bills and Efficiency!

Low pressure steam and hot water heating boilers and tank heaters that burn No. 1 Buckwheat . . . . . No mixing with expensive coal . . . . . Magazine needs filling only once in 12 to 24 hours . . . . . No blower. No motor. No electric current. No machinery to get out of order . . . . . Twenty-one sizes . . . . . *Coal bills cut one half!*

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HEATING BOILER

and **Heavy Duty Tank Heater**

MOLBY BOILER COMPANY

(Subsidiary of The Universal Pipe and Radiator Company)

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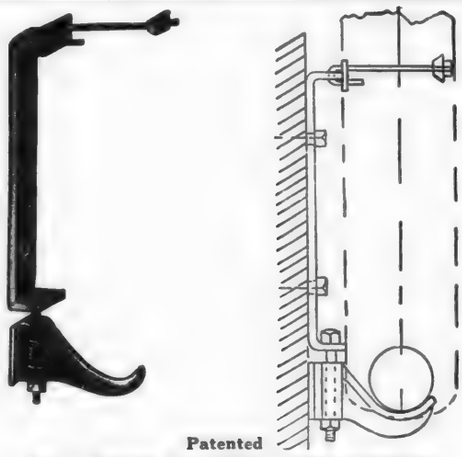


Patented

No. 9 Bracket for Legless Column Radiation

GLEOCKLE fits them all

It is not necessary to know the make of wall radiator to be used. Just specify Gleockle Adjustable Wall Radiator Brackets and your bracket requirements will be filled. They are made to fit any make of wall radiator, and besides being convenient, they are safe, durable, inexpensive and invisible after erection.

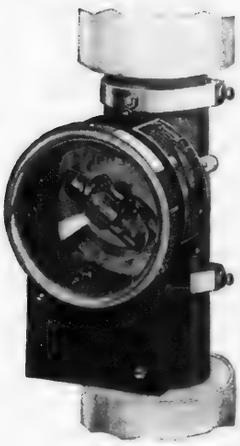
Send for descriptive booklet and trade discount

FIT ANY MAKE OF WALL RADIATOR

A. F. GLEOCKLE, Jr.

415 Bay Street **Rochester, N. Y.**

CON-TAC-TOR

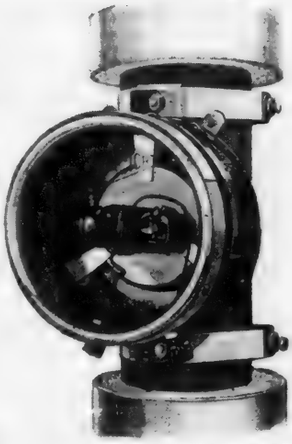


Aquaswitch No. 56
for 110 and 220 V.

MORE than five years ago Con-Tac-Tor developed the first surface-type Aquaswitch known. In five years this instrument has gained such wide use that today the Con-Tac-Tor Aquaswitch is without question the most popular single instrument in the entire oil-burner industry. As is only natural when anything of epoch-making proportions is developed, the Con-Tac-Tor Aquaswitch has been widely imitated. No imitation has ever approached the accuracy, the quality or the workmanship of the Aquaswitch now marketed by Con-Tac-Tor for both high and low voltage.

Write for Bulletin 110 in which the Aquaswitch is completely described.

BEWARE OF IMITATIONS



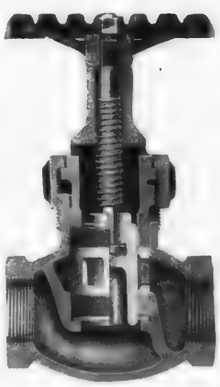
Aquaswitch No. 56 B
for Low Voltage

ABSOLUTE CON-TAC-TOR CORPORATION

ELKHART, INDIANA

For pipe lines where ordinary valves will not stand up,

try PISTON VALVES



(Klinger Patents)

Designed for severe service. Easy operation, no leaking seats, no wire-drawing, long life, close regulation, positive shut-off.

Brass, iron and steel for pressures up to 600 lbs.

Bulletin 8-T

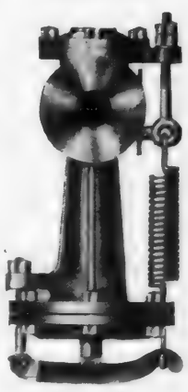
For steam lines where pressures must be reduced,

try REDUCING VALVES

(Diaphragm and relay controlled types)

These valves maintain uniform reduced pressure regardless of fluctuations of initial pressure or flow.

Brass, iron and steel for saturated and superheated steam.



Bulletin 8-R

SCHUTTE & KOERTING CO., 1153 Thompson St., PHILADELPHIA, PA.

A good and proven reputation takes years of earnest effort to build.

Concerns of national reputation hesitate to accept any equipment unless its reputation has been proved.

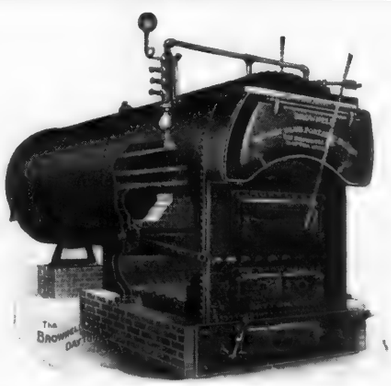
The use of Whitlock Heaters by nationally known concerns is the most positive proof of a background of sound and successful performance.

Whitlock Heaters are Dependable.

THE WHITLOCK COIL PIPE COMPANY
40 South St., Hartford, Conn.

New York, Boston, Philadelphia, Chicago, Baltimore, Detroit, Los Angeles, San Francisco, and other principal cities. Consult telephone book.

WHITLOCK HEAT TRANSFER PRODUCTS



Brownell Boilers Are Riveted Steel Boilers

No material, other than steel, could possibly measure up to Brownell's standards. Nor would Brownell jeopardize a reputation of 73 years' standing by attempting the substitution of any other material.

Prospective builders, architects, engineers and contractors should keep posted on "what's what" on the Brownell line.

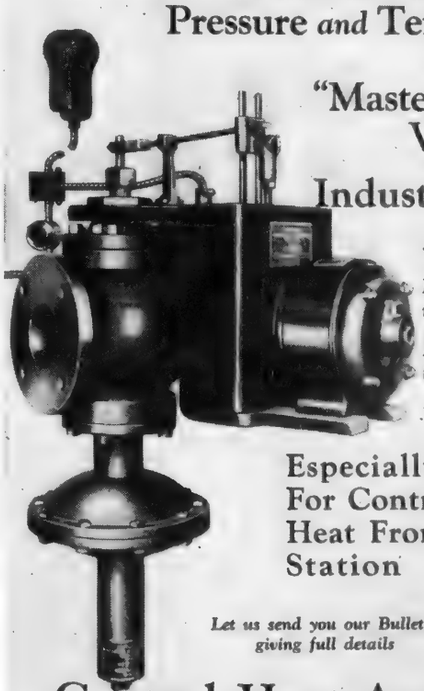
Brownells comply with ASME and all state codes. Sales Representatives everywhere—ready to serve. Bulletin B6A ready to mail.

The Brownell Company, Dayton, Ohio

Established 73 years ago.

BROWNELL

HORNUNG
Pressure *and* Temperature
2 in 1
"Master Control" Valve
(PATENTED)
Industrial Type



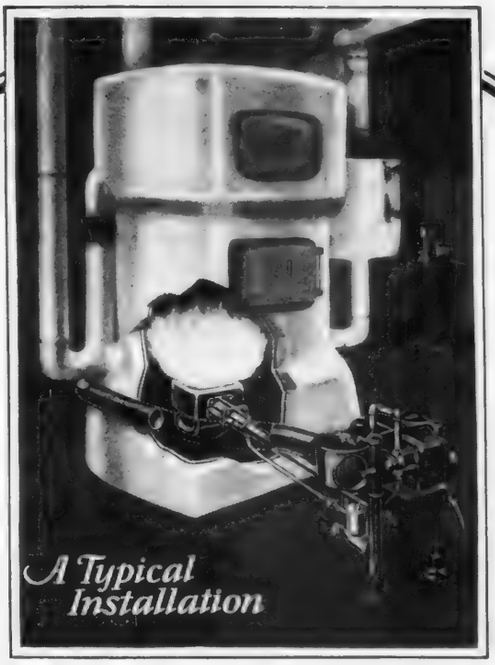
Motor Operated Directly by Thermostat

All Relays Eliminated ... ...

Especially Designed For Control of Steam Heat From a Central Station

Let us send you our Bulletin giving full details

Central Heat Appliances
J. C. HORNUNG, *Engineer*
343 South Dearborn Street Chicago, Illinois
(3475)



Only net profits *Count*

SINCE we pioneered this business, ten years ago, never have we asked Dealers to order burners until they had ready sales. In fact, we always carry ample stock for them, and co-operate perhaps more fully than any manufacturer you may know.

That's why our Dealer's enjoy *net profits* and are able to conduct a healthy growing business. And now, with Nokol in all needed sizes, we have added Aetna for commercial installations—forming the most profitable complete burner line one could hope to find!

Perhaps you would like to read our 1928 plan for Dealers? Gladly mailed upon request.

American Nokol Company
4205 Schubert Avenue - - Chicago
World's Oldest and Soundest Oil Burner Maker

NEW Silent NO Nokol COAL
CLEAN AUTOMATIC OIL HEAT

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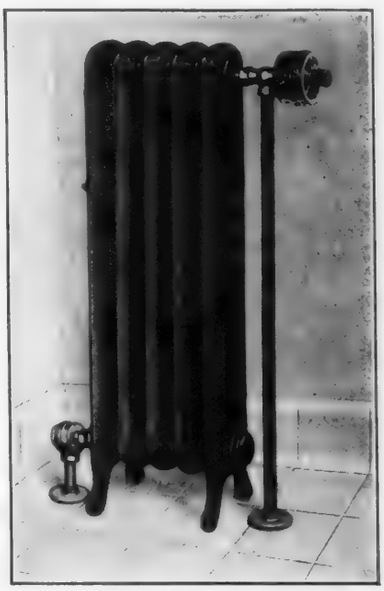
FOR INDIVIDUAL RADIATOR INSTALLATION



Installed as Easily as an Ordinary Radiator Valve

Like an ordinary radiator valve, the inlet of the valve is screwed to the supply line and a union is provided in the outlet of the valve for connection to the radiator. The valve may be rotated in the housing for either top, bottom or side feed.

Self-Contained Thermostatic Temperature Regulator

This device is not operated by compressed air and electrical connections, but is directly connected to the radiator. It is actuated by the temperature of the air that surrounds it and can be regulated to govern the temperature of the room.

Write for descriptive booklet No. 39

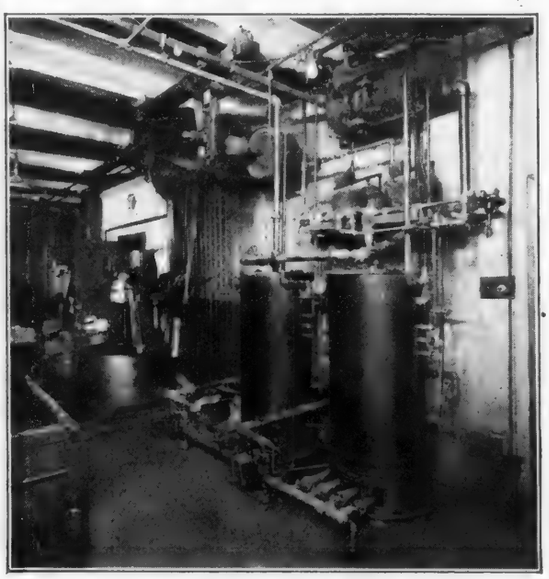
Sterling Engineering Company
1630 Holton Street, Milwaukee, Wis.

STEAM

(High or Low Pressure)

and plenty of it

—for PROCESS WORK



Two 10-H.P. Kane Boilers—Type S, used in dye works for heating vats of dye solution. New York City.

The KANE (PATENTED) BOILER

(Fire, Tube, Automatic, Gas Fired)

Easily controlled, Reliable, Simply Constructed, Efficient and Easily Cleaned,—KANE GAS FIRED BOILERS are being Economically used for a multitude of purposes in practically "every branch of Industry." We have prepared a profusely illustrated, easily read Bulletin, which every user of Process Steam should have in his files.

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BOOKS ON HEATING AND VENTILATION

THE DESIGN OF GRAVITY-CIRCULATION WATER HEATING SYSTEMS, by F. E. Giesecke, Ph. D. A book, remarkable for its conciseness and clearness of expression, which contains the essence of the information needed for the proper design of gravity water heating systems, based on the principle that the frictional resistance must equal the force maintaining flow. The importance of the presentation is evidenced by the fact that the entire water heating section of the A. S. H. & V. E. Compendium of Modern Practice has been discarded and replaced with a new section by Doctor Giesecke, embodying the methods here presented in detail. 64 pages of text and 10 pages of tables and charts. Price, $3.00.

PLUMBERS' HANDBOOK, by Samuel E. Dibble. This work contains valuable data for the heating engineer and estimator, architect, building contractor and sheet metal worker, as well as for the plumber. Each subject is treated by a specialist, the section on Pipe Standards and Pipe Dies by F. N. Speller and that on Heating by Alphonse A. Adler. Size 4 x 7 in. 629 pp. 316 ills. Cloth, $4.00.

HOUSE HEATING WITH OIL FUEL, by P. E. Fansler, Associate Editor of The Heating and Ventilating Magazine. Prepared for the use of heating and ventilating engineers, heating contractors and those engaged in the oil-burner industry. One of the outstanding features of the book is the presentation of the subject of oil combustion. Over a dozen beautiful and spectacular flame photographs were made particularly for this book in order that the subject of oil combustion might more thoroughly be presented. Three chapters are devoted entirely to the discussion of salient points of the outstanding oil burners that are on the market to-day. The chapter, "Oil Burners Listed by the Underwriters," is the only authentic, chronological list of oil burners that has been listed by the Underwriters in the past. 32 chapters totaling 362 pages and more than 150 illustrations. Size 7 x 10. Price, $4.00 postpaid.

HEATING AND VENTILATION, by the late John R. Allen and J. H. Walker. This is the second edition of this work and has been brought up to date in every particular, including the latest radiator transmission factors put out by the Research Laboratory of the A. S. H. & V. E. and the Hill synthetic air chart testing method. Especially adapted for use as a text book. Size 6 x 9 in. 322 pages Cloth, $3.50.

A. S. H. & V. E. GUIDE, 1928, sixth edition, with previous sections revised and brought up to date. Includes new tables covering heat transmission from building construction, and comprehensive tables for figuring pipe sizes for gravity, vapor, and vacuum steam heating systems, based upon A.S.H. & V.E. Research Laboratory tests on one and two-pipe steam riser capacities. Size 6 x 9 in. 680 pp. and list of A.S.H. & V.E. members. Cloth $4.00.

DESIGNING, HEATING, AND VENTILATING SYSTEM, by Charles A. Fuller. A treatise on the practical application of the engineering rules and formulas in every day use, in laying out steam, hot water, furnace and ventilating equipment for buildings of all kinds, presented in a simple manner. Price $3.00.

HEATING AND VENTILATION, by Charles W. Brabbée. This is the first American edition of the famous Heizungs-und Luftungstechnik, by Dr. H. Rietschel, and C. W. Brabbée, translated from the seventh German edition, edited and revised to make it adaptable to conditions in the United States. Supplemented by 7 charts covering steam and water heating and ventilation. Size 6 x 9 in. 332 pp. cloth $4.50.

PRACTICAL STEAM, HOT WATER HEATING AND VENTILATION, by Alfred G. King. Containing 396 illustrations. The book is a working manual for heating contractors, journeymen, steamfitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8 vo. 367 pages. Price $4.00.

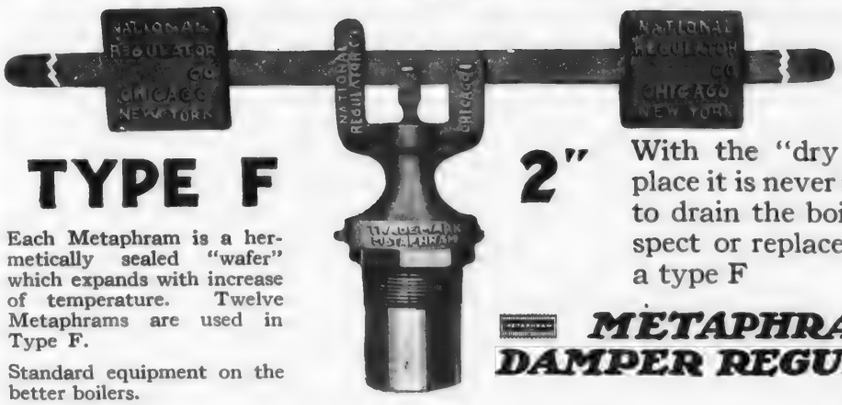
MECHANICS OF HEATING AND VENTILATING, by Konrad Meier. Including a series of ten charts containing data relating to the flow of water, steam and air, collected by Mr. Meier during an experience of 26 years in heating and ventilating work, both in this country and abroad. Each of the charts replaces a series of tables on the subject, giving at a glance the results of a calculation from any combination of factors. 161 pages, illustrated, with ten large charts. Size 6 x 9 in. Price, $5.00. Separate sets of charts printed on cloth, with lines in different colors and mounted on boards. Single charts, $1.50. Sets of ten, $15.00.

HANDBOOK FOR HEATING AND VENTILATING ENGINEERS, by James D. Hoffman. Fourth edition of this important work entirely rewritten and reset. A standard manual covering theory and practice, with special chapters on heat losses, furnace heating, water and steam heating, mechanical vacuum heating, mechanical warm-air heating, temperature control, electrical heating and refrigeration. With appendix of 75 tables. Size 4½ x 6¾ in. Pp. 478. Price $4.50 postpaid.

HANDBOOK OF THE NATIONAL DISTRICT HEATING ASSOCIATION. Devoted to data on all phases of central station heating work, including generation, distribution, utilization, meters and water heating, compiled by the Association's Educational Committee. All new and revised data for this book will be supplied free for five years. Bound in leather, with six-ring binder. Price $5.00, postpaid.

THE HEATING and VENTILATING MAGAZINE
386 FOURTH AVE., NEW YORK

Without Draining Boiler!



TYPE F **2"**

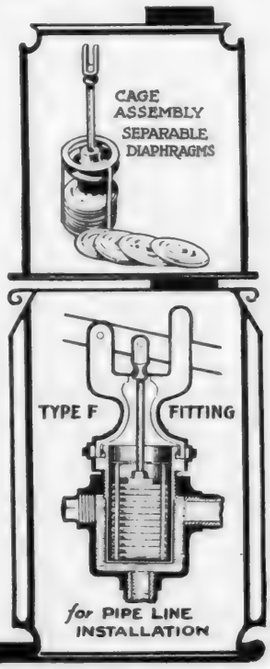
Each Metaphram is a hermetically sealed "wafer" which expands with increase of temperature. Twelve Metaphrams are used in Type F.

Standard equipment on the better boilers.

With the "dry well" in place it is never necessary to drain the boiler to inspect or replace parts of a type F

METAPHRAM DAMPER REGULATOR

The Ideal Damper Regulator for Closed Hot Water Systems



One of most powerful and most sensitive of regulators. The Metaphrams operate in a dry well which projects down into the boiler, or in Special Fitting or a Y in pipe line, and is surrounded by water. Slight change in temperature affects Metaphrams, which operate lever. Gradual action—powerful but sensitive.

Make your installation complete, more satisfactory and more profitable. Use type F on new or old jobs. Order from your jobber or direct.

NATIONAL REGULATOR CO.
2301 KNOX AVENUE CHICAGO
Manufacturers of the National System of Automatic Temperature Control

METAPHRAM

Holland Tunnel and SARCO RADIATOR TRAPS

THE Holland Vehicular Tunnel, which connects New York and New Jersey with a 9250 ft. tunnel, 50 ft. below the bed of the Hudson River, is the largest underground water tunnel in the world.

Engineers for this great engineering accomplishment—qualified by unusual experience to select the best in every line—chose Sarco Radiator Traps for the New York Administration Bldg. at the Tunnel exit.

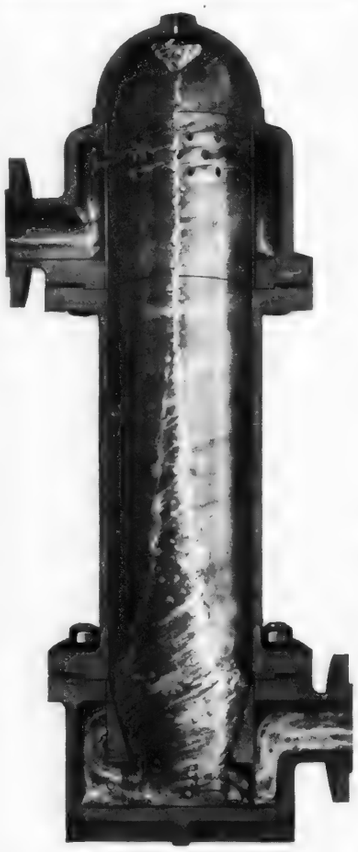
Sarco are dependable, long-lasting traps, proved by hundreds of thousands installed.

Write for Booklet P-155.

SARCO CO., Inc.
183 Madison Avenue
New York City

Boston Cleveland Philadelphia
Buffalo Detroit Pittsburgh
Chicago St. Louis
Peacock Bros., Montreal

A GOOD Heating System



CORROSION PROTECTION

Engineers! Specify

The Hickman Air Separator

Protect hot water piping—storage tanks—heating boilers —return lines from pitting and corrosion.

Its effectiveness has been proven in actual service on installations ashore and afloat, totaling more than

750,000 HORSE POWER

The first cost is surprisingly low—easy to install—maintenance nil—no moving or wearing parts—certainly worth investigating.

SOME REPRESENTATIVE USERS:

RUSS BLDG., SAN FRANCISCO
MATSON BLDG., SAN FRANCISCO
PACIFIC TEL. & TEL. BLDG., SAN FRANCISCO
MAYFAIR HOTEL, LOS ANGELES
HOTEL ROSSLYN, LOS ANGELES
RIVERSIDE HOTEL, RENO, NEV.
S. F. PUBLIC SCHOOLS, SAN FRANCISCO

Bulletin M-3—just off the press—tells the complete story. We will gladly mail it to you upon request. Every man interested in this live subject will find valuable data in this new bulletin.

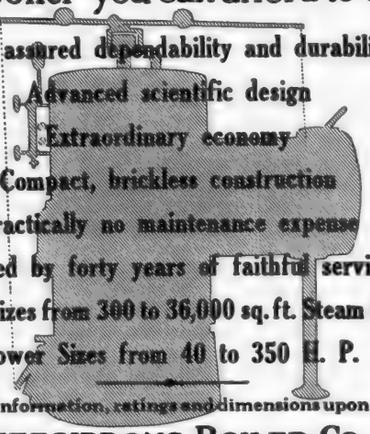
WESTERN ENGINEERING COMPANY

215 Market Street **SAN FRANCISCO, U. S. A.**

FITZGIBBONS STEEL BOILERS

"The Boiler you can afford to own"

Steel-assured dependability and durability
Advanced scientific design
Extraordinary economy
Compact, brickless construction
Practically no maintenance expense
Proved by forty years of faithful service
Heating Sizes from 300 to 36,000 sq. ft. Steam Rating
Power Sizes from 40 to 350 H. P.



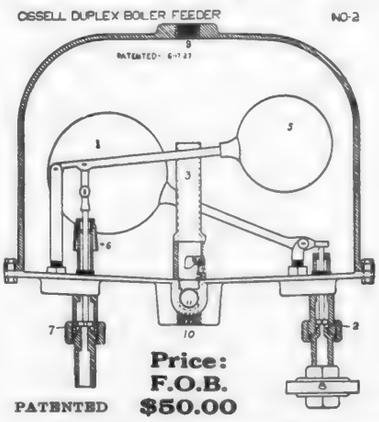
Complete information, ratings and dimensions upon request

FITZGIBBONS BOILER CO.
INCORPORATED
570 Seventh Ave., New York, N. Y.

Now is the Time

For Real Boiler Protection

While Also Increasing Its Efficiency



Price: F.O.B.
PATENTED **$50.00**

This Duplex feeder, built especially to meet conditions existing in heating boilers, will make your boiler absolutely automatic, eliminating danger of burning boiler or cracking sections. In selecting a boiler feeder you want the best; thousands of these feeders are in use and never a complaint. So sure are we as to its efficiency, that we sell it with an ABSOLUTE GUARANTEE.

Write for Full Particulars and Discount

Manufactured by

W. M. CISSELL MFG. CO., INC.
111 South Second Street **LOUISVILLE, KY.**

平和貯蓄

根は如何に

花も信用

省く遜色

THE above means that two Patterson Indestructo Copper-Lined Hot Water Heaters were installed in the new $10,000,000 Mitsui Bank in Tokyo, Japan—the largest bank in Asia.

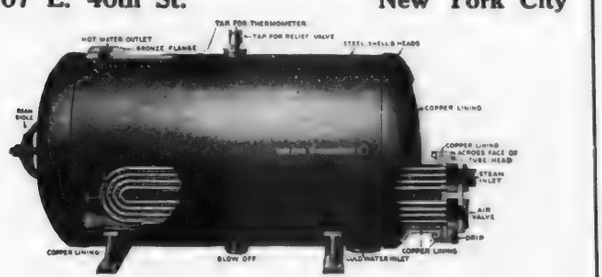
Japan is too far from New York to take chances on heaters that might "act up" and need repairs or attention. So Trowbridge & Livingston, New York Architects, specified the "Patterson", knowing that they could depend on us to make good if these heaters did not make good our guarantee to furnish all the hot water required, as hot as required, and as quickly as required.

Patterson Indestructo Hot Water Heaters have a complete copper lining. Consequently they can't rust, and are practically everlasting. No danger of rust eating holes in the metal or backing up into the pipes and retarding circulation and increasing fuel bills.

Send for catalog.

The Patterson-Kelley Co.

107 E. 40th St. New York City



Patterson

Indestructo Copper-Lined Hot Water Heater

YOU CAN'T AFFORD TO GAMBLE

THE
FOXBORO COMPANY
GUARANTEES TO REPAIR OR REPLACE, FREE OF CHARGE WITHIN ONE YEAR FROM DATE OF SHIPMENT, ANY INSTRUMENT THAT DOES NOT PROVE PERMANENT IN CALIBRATION AND FREE FROM DEFECTS IN WORKMANSHIP AND MATERIAL.
BEFORE REMOVING THIS SEAL
READ THE GUARANTEE AND INSTALLATION INSTRUCTIONS
FINAL INSPECTION
BY 241
FOXBORO
REG. U.S. PAT. OFF.

When you buy instruments designed to eliminate the element of chance from production processes, *go one step further.*

Eliminate the chance of getting the wrong instrument. Demand tangible evidence that *prior to purchase* the instrument is capable of doing the work for which it is designed.

To every Foxboro Recording and Controling Instrument is sealed a guarantee of permanent calibration, workmanship and materials. Foxboro Instruments are the only instruments so guaranteed.

If you buy on a basis of *past* performance, you will choose Foxboro. Foxboro Instruments have the unqualified endorsement of the leaders in every industry.

If you buy on a basis of future performance, the Foxboro sealed guarantee will determine your choice.

The national Foxboro organization stands back of each Foxboro Instrument. When you need accurate, dependable instruments of *known quality,* write or wire our nearest office.

THE FOXBORO COMPANY

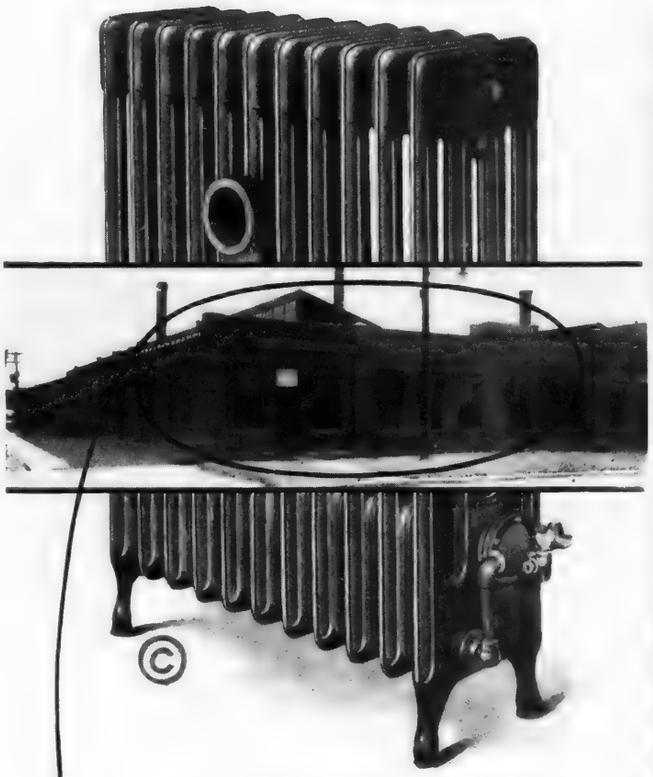
Neponset Avenue, Foxboro, Mass., U. S. A.

New York Chicago Philadelphia Boston Pittsburgh
Detroit Cleveland Tulsa Rochester, N. Y. Atlanta
San Francisco Los Angeles Portland, Ore.

FOXBORO

REG. U. S. PAT. OFF.

THE COMPASS OF INDUSTRY



Profitable Heating Business You Can Get—5 Radiators Brought 50 More

Above is the American Three-way Prism Company, 1315 S. 55th Ct., Cicero, Ill.—where 5 Clow Gasteam Radiators provide all the heat required by the office *all year*.

Fall, Spring, and after hours, these radiators supply office heat without wasting heat on the factory section which does not need it.

These Gasteam Radiators have been found so convenient—so practical—that their company has purchased about 50 additional radiators for use in their factory.

Gasteam can mean a good, profitable business for heating contractors, in plants such as this, and in many other types of jobs. Send for our catalog today.

JAMES B. CLOW & SONS
201-299 North Talman Avenue, Chicago.

CLOW GASTEAM

Paracoil Storage Water Heater

Hot Water

—even when the fires are banked

Installed below the water line of a steam boiler, Paracoil Storage Water Heaters give far superior results and supply plenty of hot water for domestic purposes even when fires are banked.

Paracoil Storage water heat can be used the same as the smaller indirect domestic heater. No extra boiler is required and a worthwhile saving in fuel is effected.

Write for "hook up" diagrams and bulletins showing results obtained in many prominent Paracoil installations.

DAVIS ENGINEERING CORP.
90 WEST STREET NEW YORK CITY

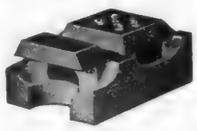
Also Manufacturers U-Tube Indirect and Resident Water Heaters.

Paracoil
STORAGE
WATER HEATERS

Burn anything from Egg to Screenings with Pyramid Grates

The wide range in fuel which **PYRAMID GRATES** burn makes them highly economical.

Let us show you how you can cut your coal bills and have satisfactory heating.



PYRAMID IRON PRODUCTS CO.
136 Liberty Street New York City

Every Heating and Ventilating Engineer

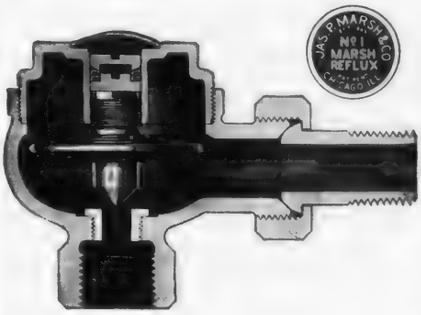
should have a copy of this Atlas Junior Catalog No. 21.

Check off items in which you are interested, mail to us, and you will receive the catalog, prices and whatever you may need in the way of information on any Atlas product.

- ☐ Reducing Valves
- ☐ Damper Regulators
- ☐ Temperature Regulators
- ☐ Pump Governors
- ☐ Float Valves
- ☐ Swing Joint Fittings
- ☐ Bronze Unions
- ☐ Thermostats
- ☐ Balanced Valves

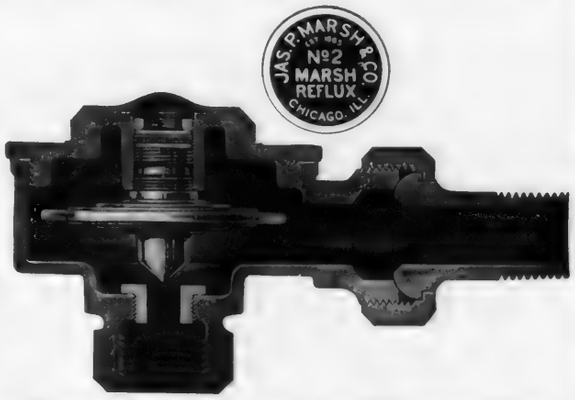
ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street, Newark, N. J.

MARSH REFLUX THERMOSTATIC RADIATOR TRAPS



GUARANTEE ON EVERY TRAP

If any Marsh Reflux Trap might develop a defect in material, workmanship or operation inside of five years after date of installation, such Trap would be replaced free of charge.



The Most Economical, Practical and Efficient Trap for the Average Sized Unit

Marsh Reflux Traps assure full efficiency of Radiator Coil and System.

Automatically discharge air and the water of condensation as fast as it is formed.

The Trap closes the instant steam or vapor strikes the thermostatic diaphragm. Vapor or steam cannot pass through the Trap; therefore every atom of heat is given off in the radiator or coil.

Just one movable part—nothing loose to rattle, chatter or make a noise.

Neat in appearance, handsomely finished and heavily nickel-plated.

The Economical, Practical and Efficient Trap for Both Small and Large Units

Marsh Reflux Traps are all-metal construction including heavy cast brass body, handsomely nickel-plated and with extra heavy special tail piece.

The one movable part—a genuine phosphor bronze non-collapsible Thermostatic Diaphragm—contains the combination of volatile fluids so balanced as to, at all times, distinguish between air and water of condensatien and vapor or steam. So corrugated and constructed to eliminate the slightest possibility of rupture from alternate expansion and contraction.

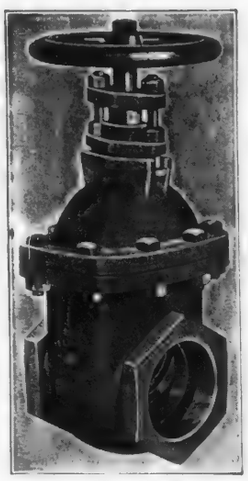
JAS P. MARSH & CO. 114-124 So. Clinton St. ESTABLISHED 1865 **Chicago**

62 YEARS CONTINUOUS EXPERIENCE IN MANUFACTURE OF STEAM SPECIALTIES

Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents—Indicating and Recording Gauges

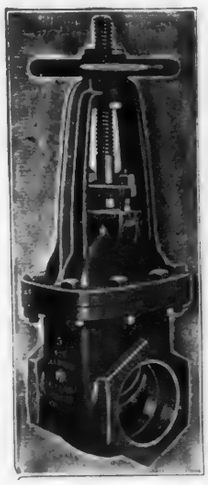
Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario.

IRON BODY GATE VALVES



SCREWED, FLANGED
AND
HUB END STYLES

NON-RISING STEM
AND
O. S. and Y. PATTERNS

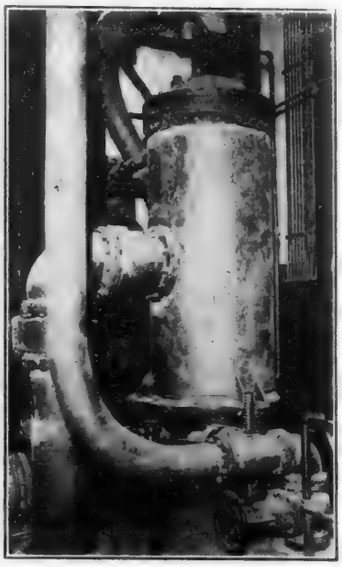


ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings

Illinois Malleable Iron Company

1801 Diversey Parkway :-: :-: Chicago, Ill.

Hot Water Heating System Heaters



View of one of the Wainwright hot water heaters used in the system for heating a large group of buildings. The temperature of the circulating water is varied in the central heating plants according to outside weather.

The largest single hot water heating system in the world is located in New York City. This system serves a group of buildings occupying approximately eight city blocks.

The temperature of the entire system is controlled from the power plant. By varying steam pressure in the Wainwright heaters and the speed of Wheeler circulating pumps which force the water through the system, the temperature of the outgoing water is regulated.

A single season's experience furnished the necessary data for predetermining the outgoing water temperature necessary for comfortable heating at various outside temperatures.

FOSTER WHEELER CORPORATION
165 BROADWAY, NEW YORK, N. Y.
Branches in Principal Cities

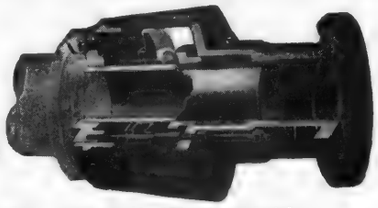
CENTRAL STATION STEAM CO.
2912 East Woodbridge St.
DETROIT, MICHIGAN

MANUFACTURERS OF

Cadillac Condensation Meters
Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.

ROSS
Crosshead-GUIDED Expansion Joint Excels in



Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.
New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.

National No-Coil Hot Water Storage Tank

For use in Hotels, Clubs, Apartment and Public Buildings, or any place where a large amount of hot water is used.

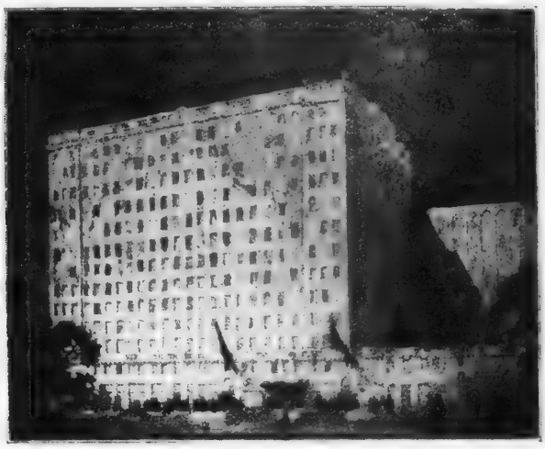
The National No-Coil Hot Water heater supplies a large volume of water hot continuously. This is accomplished by the steam jacket which is welded to the shell of the tank. This method affords a large amount of heating surface and assures quick response. Steam jacket is properly proportioned to heat the contents of tank with steam pressure not exceeding five pounds.

Tanks are for horizontal installation, tested to hydrostatic pressure of 150 lbs. to the square inch and guaranteed for working pressure of 100 lbs.

There is a suitable size for every requirement. Let us send full details.

National Steel Tank & Mfg. Company
BRADFORD, ILLINOIS

500 NEW JENKINS MODULATING VALVES INSTALLED IN THIS HOTEL



A Donald Douglass aquatint study of the EASTLAND HOTEL, PORTLAND, ME. Architect, Herbert W. Rhodes; Engineers and Heating Contractors, The Fels Co.; Plumbing Contractor, Scribner and Iverson; Owners, Congress Square Hotel Co.

Five hundred Jenkins Modulating Valves serve the new Eastland Hotel in Portland, Maine. They play a big part in keeping good heating at its best in vacuum heating systems.

Jenkins Fig. 700 has a vertical seat instead of the usual type of horizontal seat. Due to this feature, scale or core sand from radiators is prevented from lodging on the seat and hindering the tight closing of the valve. The vacuum is under the disc holder, not on top; thus there is no loss of vacuum when the valve is closed. Furthermore, this valve has a packless stuffing box.

A folder giving further details on this type of valve will be sent on request and we shall be pleased to send a representative at any time to show you a sample valve.

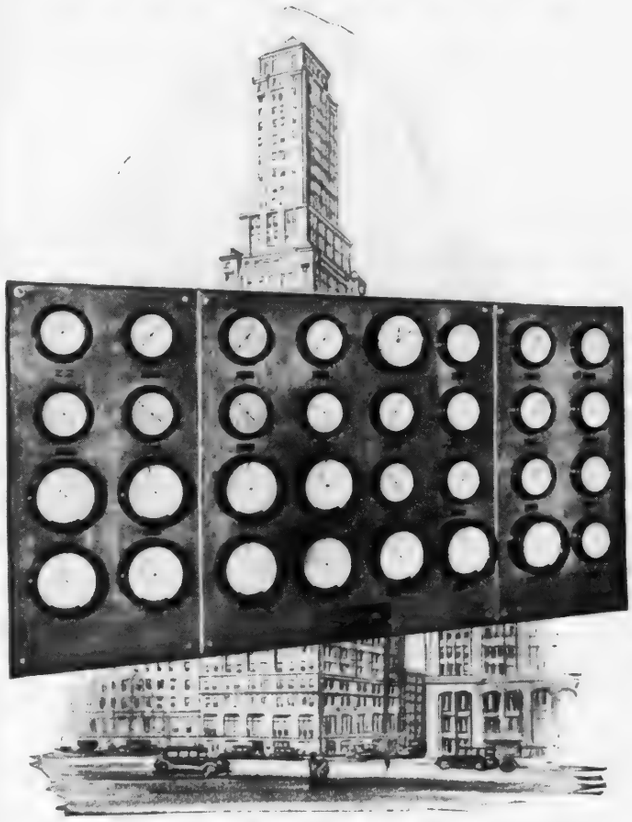
JENKINS BROS.

80 White Street.....New York, N. Y.
524 Atlantic Avenue.....Boston, Mass.
133 No. Seventh Street.....Philadelphia, Pa.
646 Washington Boulevard.....Chicago, Ill.

JENKINS BROS., Limited
Montreal, Canada.....London, England

Fig. 700
Jenkins Modulating Valve

GAUGE BOARDS



American Gauge Board in new Transportation Bldg., New York.
Frank Sutton, New York, Consulting Engineer, Baker Smith & Co., New York, Heating Contractors.

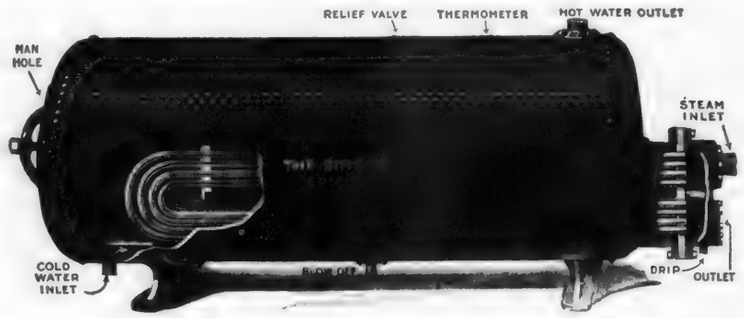
American Gauges, Recording Gauges, Dial Thermometers, Recording Thermometers and Clocks are furnished in the same case for uniformity of appearance, either for wall or flush mounting. They make ideal gauge board installations.

Write for the following Catalogs:

Gauge Catalog A-14,
Recording Gauge Catalog E-14,
Gauge Tester Catalog D-14,
Relief and Pop Valve Catalog V-14,
Thermometer Catalog F-14,
DialThermometer Catalog G-14,
Recording Thermometer Catalog H-14,
Temperature Controller Catalog R-14.

AMERICAN INSTRUMENTS

American Schaeffer & Budenberg Corporation
338 Berry St., Brooklyn, N. Y.
Branches in Principal Cities
Makers of American Industrial Instruments since 1851.



"We keep others in Hot Water"

SIMS

Storage type water heaters are furnished with "U" tubes as illustrated, or with straight tubes and floating head, as may be desired or specified.

SIMS

Water tube heaters and Converters are also constructed with either straight or "U" tubes.

All heaters are produced complete in our plant. They are not an assembly of parts built by others.

THE SIMS COMPANY, P. O. Box 700 Erie, Penna.

SWARTWOUT
Steam Products

Swartwout Bucket Type Steam Trap

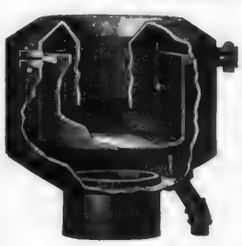
Intermittent action—pressures to 250 lbs. Trouble-Free.

Steam Separators
Return, Lifting and Vacuum Trap
Steam Separators—Receiver Type
Low Pressure Float Trap
Air Separator
Cast Iron Exhaust Head
Cast Iron Strainer

THE SWARTWOUT CO.

General Offices: 18525 Euclid Ave., Cleveland, Ohio
Factories: Cleveland and Orrville, Ohio

DICKINSON ALL-CAST-IRON EXHAUST HEAD

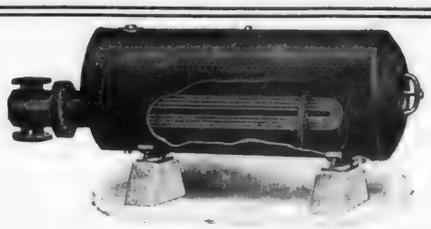


Prevents oil and water content of the exhaust system from escaping and falling upon the roof, which otherwise would bring about a condition of decay and disintegration.

Dickinson Exhaust Heads will last as long as the average building.

Made of All-Cast-Iron

ÆOLUS DICKINSON
3336-44 So. Artesian Ave. CHICAGO
(Some territory open for agents)



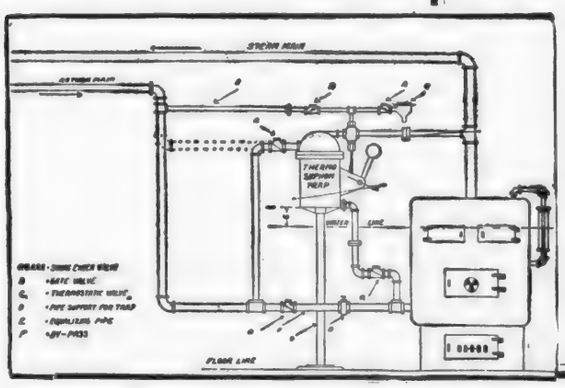
Engineers' specifications are generally "Frank." Our Straight Tube and U-Tube heaters are built for durability. All parts are of flange steel. They have the unreserved approval of leading heating engineers.

Write us for full details

O. E. Frank Heater & Engineering Co., Inc.
Factory and Offices at Buffalo, N. Y.

For All Types of Steam Heating Systems

Application of Thermo Syphon Trap, showing proper method of piping, for draining any heating system.
For draining vapor, vacuum or any system *without pressure on the returns*, the return line may be run direct to inlet of trap as shown by dotted line.



THERMO SYPHON TRAP

Boilers Are Carefully Selected —Why Not Protect Them?

Should not a boiler that has to meet exacting requirements be protected? We have taken this question seriously and have devoted years to the study of guarding the boiler against the ever-present danger of low water line.

Boilers are safeguarded against burning or cracking when equipped with Thermo Syphon Traps. All condensation is returned to the boiler, maintaining the water line, regardless of pressure or vacuum.

As well as protecting the boilers, Thermo Syphon Traps assure proper circulation and noiseless operation. Prevent air-bound or water-logged conditions.

Send for Bulletin No. 16-HV, giving full details.

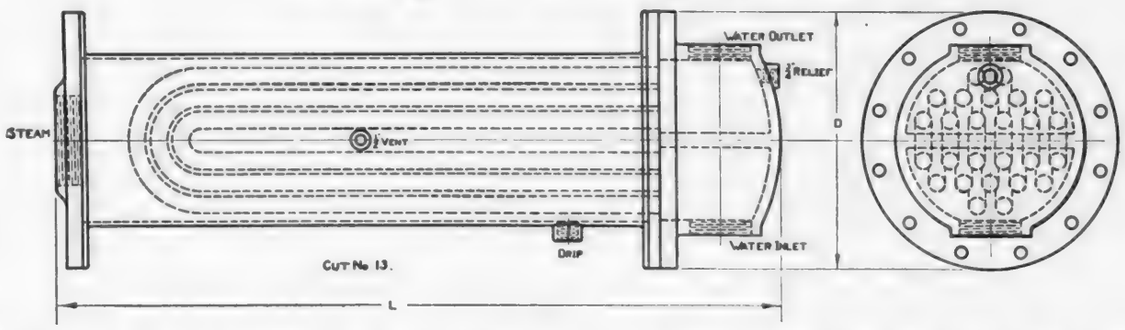
LYTTON MANUFACTURING CORPORATION FRANKLIN, VIRGINIA

HIGH GRADE Return, Vacuum, Lifting and Separating Steam Traps, Reducing Valves, Blow-off Valves

NATIONAL

PREHEATERS or U BEND TYPE Condensation Coolers

soon pay for themselves in saving heat lost through discharge of heating systems



Much heat is lost in allowing the condensation discharge from the heat you buy to pass off into the sewer. By using a National Preheater or Condensation Cooler, the condensation passes through the heater where the U bend element extracts the heat still in the condensation and uses it for domestic hot water supply. You also eliminate trouble resulting from high temperature condensation emptying into the sewage system.

Furnished in All Sizes. Write for Quotations.

THE NATIONAL PIPE BENDING CO.

120 River Street, New Haven, Conn. **Boston—New York—Philadelphia**

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS
American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.

AIR CONDITIONING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Typhoon Fan Co., New York.
York Heating & Ventilating Corp., Phila., Pa.

AIR COOLING & DRYING SYSTEMS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Seymour, James M., Newark, N. J.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass
Thermal Units Co., Chicago, Ill.

AIR ELIMINATORS
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

AIR FILTERING UNITS
American Blower Co., Detroit, Mich.
Connor Co., Inc., The W. B., New York.
DeBothezat Impeller Co., Inc., New York
General Air Filters Corp., New York.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.

AIR SEPARATORS
Bishop & Babcock Sales Co., Cleveland, Ohio.
Swartwout Co., The, Cleveland, Ohio.
Western Engineering Co., San Francisco, Calif.

AIR WASHERS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

BELLOWS, METAL
Cook Electric Co., Chicago, Ill.

BELTING
Alexander Bros., Inc., Philadelphia, Pa.

BLOWERS, FAN
(See Fans, Supply & Exhaust).

BLOWERS, PRESSURE
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Johnson Fan & Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BLOWERS, ROTARY
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BLOWERS, TURBINE
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BOILER CEMENT
Johns-Manville Corp., New York.

BOILERS, DOWN-DRAFT
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Moby Boiler Co., New York.
National Radiator Corp., Johnstown, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

BOILERS, GAS-FIRED
American Radiator Co., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

BOILERS, HEATING
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Bryan Steam Corp., Peru, Ind.
Burnham Boiler Co., Irvington, N. Y.
Coatesville Boiler Works, Coatesville, Pa.
Fitzgibbons Boiler Co., Inc., New York.
Freeman Mfg. Co., Racine, Wis.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corporation, New York.
Heggie-Simplex Boiler Co., Joliet, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Moby Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa.
National Radiator Corp., Johnstown, Pa.
Orr & Sembower, Inc., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Spencer Heater Co., Williamsport, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Thatcher Co., The, Newark, N. J.
Titusville Iron Works Co., The, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.

BOILERS, MAGAZINE FEED
Gorton Heating Corporation, New York.
Moby Boiler Co., New York.
Spencer Heater Co., Williamsport, Pa.

BOILERS, OIL-FIRED
Bryan Steam Corp., Peru, Ind.
Johnston Brothers, Inc., Ferrysburg, Mich.

BOILERS, POWER
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Heggie-Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Orr & Sembower, Inc., Reading, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

CALORIMETERS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Heat Transfer Products, Inc., New York
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York
Whitlock Coil Pipe Co., Hartford, Conn.

CONCRETE INSERTS
Gleockle, Jr., A. F., Rochester, N. Y.

CONDENSERS
Davis Engineering Corp., New York.
Foster Wheeler Corporation, Carteret, N. J.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Heat Transfer Products, Inc., New York
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

COPPER BOILERS
Badger & Sons Co., E. B., Boston, Mass.

COPPER KETTLES
Badger & Sons Co., E. B., Boston, Mass.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Banner Rock Products Co., Alexandria, Ind.
Johns-Manville Corp., New York.
Ric-wiL Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

DAMPERS, DUCT
American Foundry & Furnace Co., Bloomington, Ill.
Buckeye Blower Co., The, Columbus, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Pecco, Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

DISTILLERS, (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Midwest Air Filters, Inc., Bradford, Pa.
Pecco, Inc., St. Louis, Mo.
Reed Air Filter Co., Inc., Louisville, Ky.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Phila., Pa.

ENGINES, STEAM, AUTOMATIC
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

ENGINES, STEAM, HIGH SPEED
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., The, Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Foster Wheeler Corporation, Carteret, N. J.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York
Webster & Co., Warren, Camden, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, DISC PRESSURE
DeBothezat Impeller Co., Inc., New York.

FANS, SUPPLY AND EXHAUST
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Emerson Electric Mfg. Co., St. Louis, Mo.
Johnson Fan & Blower Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Typhoon Fan Co., New York.
Wing Mfg. Co., L. J., New York.

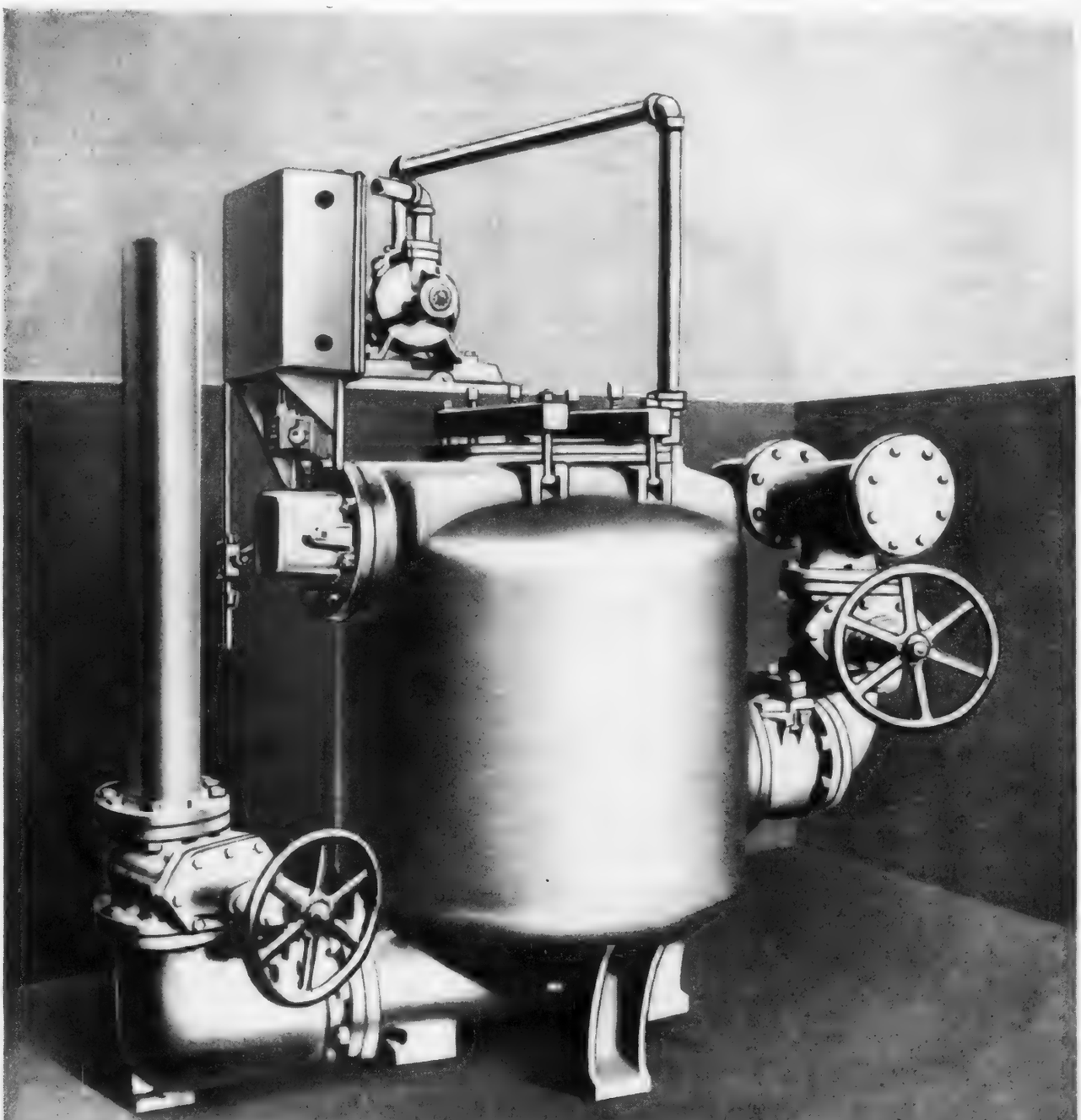
FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Cissell Mfg. Co., W. M., Louisville, Ky
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

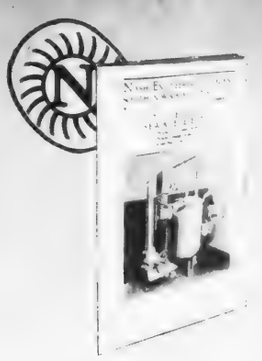
FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, DISTRIBUTOR
Blake Specialty Co., Rock Island, Ill.

FITTINGS, FLANGED
Clow & Sons, James B., Chicago, Ill
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.
Walworth Co., New York





THIS Jennings Sewage Ejector is supplied in capacities up to 1500 g.p.m. Heads up to 50 ft. For pumping unscreened sewage or drainage from basements below the street sewer level, handling crude sewage from low level districts, pumping effluent, sludge and other heavy liquids. Write for Bulletin No. 67.

NASH ENGINEERING COMPANY
81 Wilson Road So. Norwalk, Conn.

Jennings Pumps

FLANGES
Clow & Sons, James B., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Powell Co., Wm., The, Cincinnati, Ohio.
Walworth Co., New York

GAS ANALYZING INSTRUMENTS
Hays Corp., Michigan City, Ind.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
Security Stove & Mfg. Co., Kansas City, Mo.

GASKETS, ASBESTOS
Jenkins Bros., New York.
Johns-Manville Corp., New York.

GASKETS, METALLIC
Jenkins Bros., New York.

GASKETS, RUBBER
Jenkins Bros., New York.

GAUGE BOARDS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Clow & Sons, James B., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., The, Cincinnati, Ohio.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
United States Radiator Corp., Detroit, Mich.

GAUGES, DRAFT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Hays Corp., Michigan City, Ind.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Walworth Co., New York

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Inc., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS, (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio
Titusville Iron Works Co., The, Titusville, Pa

GRATES, ROCKING
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.

GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.
Pyramid Iron Products Corp., New York.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRILLES
American Foundry & Furnace Co., Bloomington, Ill.
Metalace Corporation, Boston, Mass.

HEAT CABINETS
Clow & Sons, James B., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Metal Stamping Co., Long Island City.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Rome-Turney Radiator Co., Rome, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Blake Specialty Co., Rock Island, Ill.
Davis Engineering Corp., New York.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Moby Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
National Steel Tank & Mfg. Co., Bradford, Ill.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., The, Erie, Pa.
Thatcher Co., The, Newark, N. J.
Thermal Appliance Co., New York.
Titusville Iron Works Co., The, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.
Johnson Fan & Blower Co., Chicago, Ill.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corporation, Carteret, N. J.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER, (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Heat Transfer Products, Inc., New York
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Thermal Appliance Co., New York.
Titusville Iron Works Co., The, Titusville, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Typhoon Fan Co., New York.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

HEATING SYSTEMS, GAS
Clow & Sons, James B., Chicago, Ill.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Spencer Heater Co., Williamsport, Pa.
Thatcher Co., The, Newark, N. J.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
York Heating & Ventilating Corp., Phila., Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Temperature Indicating Co., Toledo, Ohio.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

INSULATION, BOILER, PIPE, ETC.
(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.
Johns-Manville Corp., New York.

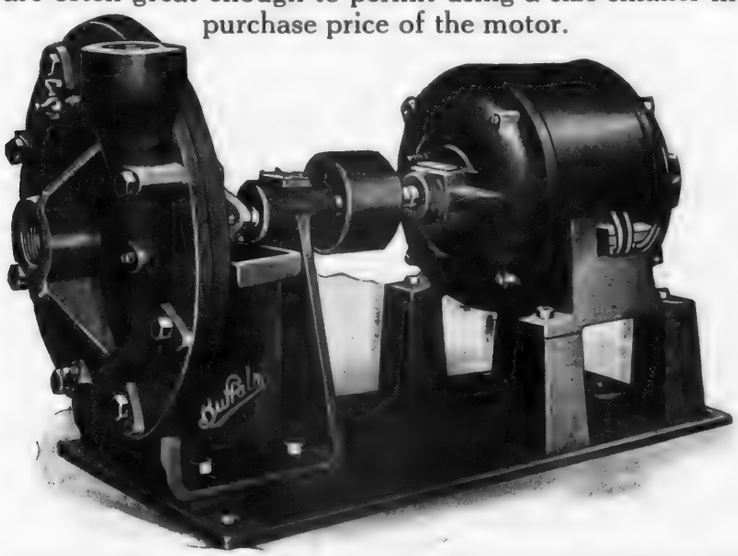
MANOMETERS
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Mason Regulator Co., Boston, Mass.
New York Blower Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

A New Development

New in performance—New in efficiency—New in its price class! But not new in the sense of being experimental. It has been subjected to the most severe testing. Definite performance curves and rating tables have been established.

Efficiencies are far higher than those now accepted as standard pumps of this type. Differences are often great enough to permit using a size smaller motor, saving not alone in power but in the purchase price of the motor.



Outstanding Features of the Class "CH"

1. High efficiency.
2. Superior performance with open impellers, for gritty, lumpy or viscous liquids.
3. Eight different positions of discharge.
4. "Buffalo" combined pulley-coupling (patent applied for).
5. Ring-oiling bearing next to pulley-coupling.
6. A price which makes it one of the greatest pump values ever offered.

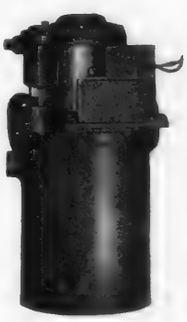
Buffalo Steam Pump Co.
480 Broadway, Buffalo, N. Y.
In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Protect Yourself! Protect Your Profits!
TEESDALE Pumps Minimize Service Costs!

MAKE a profit—and keep it! Don't let costly servicing eat up your profits! Efficient, dependable, economical operation and engineering that does the job right, make TEESDALE Automatic Pumps *preferred* as standard oil burner equipment.

Type L—Pump capacity 30 gals. per hour. The oil pump is the same in all respects as our TU Model (illustrated to the left), and is known as the "Quietest Pump On The Market." 50 gals. reserve-oil supply tank prevents oil tank from going dry on the job, there being always a reserve supply of 30 gals. of oil to tide the consumer over until his outside oil tank can be refilled. Adjustable legs allow maximum clearance of 18" between tank bottom and floor; legs also cut any dimension to your order. *Not listed by Underwriters.*

Tank size 21" diameter, 30" high. Built of 16 gauge steel finished in green and black.

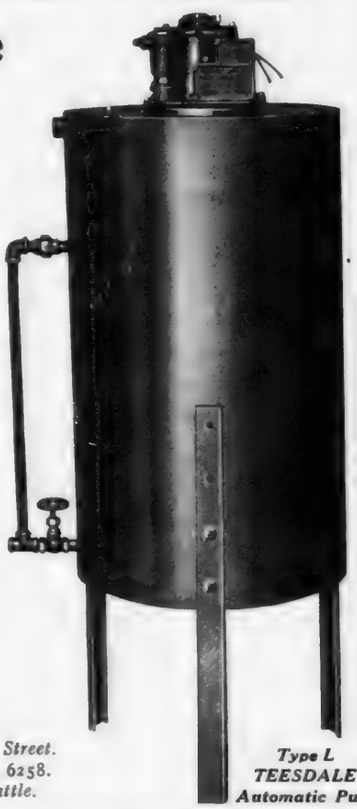


Listed as standard by Underwriters' Laboratories. Approved, Board of Standards and Appeals, N. Y.

Type T U
TEESDALE
Automatic Pump

TEESDALE MFG. CO.
429 Market Street
Grand Rapids, Mich., U.S.A.

New York Warehouse: Walters Warehouse, 410 W. 52nd Street.
Philadelphia Branch: 3931 N. Broad St. Phone, Wyoming 6258.
Pacific Coast Warehouse: Taylor Edwards Warehouse, Seattle.



Type L
TEESDALE
Automatic Pump

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.
Spray Engineering Co., Boston, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.

MOTORS (ELECTRIC)
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Lincoln Electric Co., Cleveland, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
American Nokol Co., Chicago, Ill.
Automatic Burner Corp., Chicago, Ill.
Baker Steam Motor Car & Mfg. Co., Pueblo, Colo.
Cleveland Steel Products Corp., Cleveland, Ohio
Commonwealth Engineering Co., Chicago, Ill.
Eisler Engineering Co., Newark, N. J.
Gulf Oil Burner Co., Philadelphia, Pa.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
Laco Gas Burner Co., Griswold, Iowa.
McIlvaine Burner Corporation, Chicago, Ill.
Nu-Way Corporation, Rock Island, Ill.
Petroleum Heat & Power Co., New York.
Preferred Oil Burners, Inc., Peoria, Ill.
Security Stove & Mfg. Co., Kansas City, Mo.
Sundstrand Engineering Co., Rockford, Ill.
Winslow Boiler & Engineering Co., Chicago, Ill.

OIL BURNER EQUIPMENT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Cook Electric Co., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Monroe Machine Tool Co., Chicago, Ill.
Preferred Utilities Mfg. Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Teesdale Mfg. Co., Grand Rapids, Mich.
Webster Electric Co., Racine, Wis.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Federal Gauge Co., The, Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Webster Electric Co., Racine, Wis.

OZONE APPARATUS
United States Ozone Co., Chicago, Ill.

PIPE, CAST IRON
Clow & Sons, James B., Chicago, Ill.

PIPE, STEEL
Clow & Sons, James B., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PIPE, WOOD
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE HANGERS
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York

PIPE THREADING & CUTTING MACHINES
National Pipe Bending Co., New Haven, Conn.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED
Horton Mfg. Co., Minneapolis, Minn.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, Carteret, N. J.
General Air Filters Corp., New York.
Monroe Machine Tool Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
General Air Filters Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

PUMPS, OIL
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Monroe Machine Tool Co., Chicago, Ill.

PUMPS, ROTARY
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, TURBINE
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, Carteret, N. J.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Economy Pumping Machinery Co., Chicago, Ill.
Monroe Machine Tool Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.

RADIATOR ENCLOSURES OR SHIELDS
Acme Radiator Shield Co., Cincinnati, Ohio.
American Metal Products Corp., St. Louis, Mo.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Gleockle, Jr., A. F., Rochester, N. Y.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.
United States Radiator Corp., Detroit, Mich.

RADIATORS, BRASS
Rome Brass Radiator Corp., New York.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.

RADIATORS, GAS HEATED
Clow & Sons, James B., Chicago, Ill.

RADIATORS, STEAM & WATER
American Radiator Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Moiby Boiler Co., New York.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Thatcher Co., The, Newark, N. J.
United States Radiator Corp., Detroit, Mich.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Breese Engineering Corp., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Hutchison Regulator Sales Corp., New York
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Teeple Co., L. R., Portland, Oregon

REGULATORS, TEMPERATURE
(See Temperature Control).

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Swartwout Co., The, Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Seymour, James M., Newark, N. J.

SPRAY NOZZLES
(See Nozzles, Spray).

STRAINERS, OIL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Monroe Machine Tool Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

TEMPERATURE CONTROL
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Raymond, F. I., River Forest, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Teeple Co., L. R., Portland, Oregon
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

THERMOMETERS, RECORDING & INDICATING
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Temperature Indicating Co., Toledo, Ohio.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa
Pierce, Butler & Pierce Mfg. Corp., New York.
Powers Regulator Co., Chicago, Ill.
United States Radiator Corp., Detroit, Mich.

THERMOSTATS
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

Bulletin also describes the American-Marsh Junior, a small, low-priced unit for private homes and apartments.

Complete Information on Standard Equipment

WRITE for our new Bulletin shown above. It will come in mighty handy the next time you have occasion to figure a drainage or sewage handling job.

American-Marsh Bilge Pumps and Sewage Ejectors, built in all necessary sizes, are unusually simple of design and extra sturdy throughout. They are the kind of pumps you like to recommend and use—safe, efficient, entirely automatic in operation.

The Bulletin includes complete capacity ratings and sample specifications, making it exceedingly valuable as a reference on standard equipment.

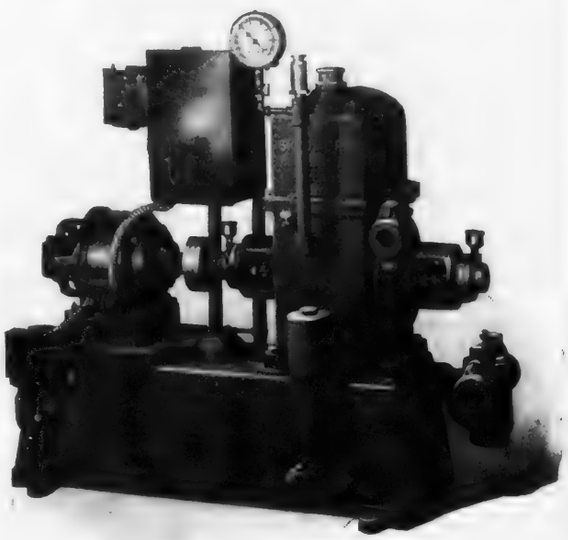
Give it a place in your file.

AMERICAN-MARSH

AMERICAN STEAM PUMP COMPANY
BATTLE CREEK, MICHIGAN
Sales Engineers in all of the Important Cities

Pumping Equipment

SKIDMORE



Which Will You Have

high or low water line in the system when operating on float control?

The Skidmore pump on interceptor base is designed to give low water line operation without pitting.

The unit is self contained, ball bearing, and operated by one motor. It produces vacuum on the system even when operating on float control, a desirable feature.

The unit consists of two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed. Motor and pump are mounted directly on interceptor base. This construction means compactness in design and minimum floor space occupied.

The automatic starter together with vacuum regulator and float switch are mounted on this unit. All wiring is installed at the factory.

Bulletin No. 5 illustrating this unit is now available.

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National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

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Swartwout Co., The, Cleveland, Ohio.

TRAPS, FLOAT

Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Sarco Co., Inc., New York.
Swartwout Co., The, Cleveland, Ohio

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Works, Three Rivers, Mich.

TRAPS, LIFTING

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Swartwout Co., The, Cleveland, Ohio.

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Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
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Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
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Kieley & Mueller, Inc., New York.
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Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
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Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
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Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNDERGROUND PIPE CONDUITS

American District Steam Co., North Tonawanda, N. Y.
Johns-Manville Corp., New York.
Ric-wiL Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Kelly Brass Works, Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Russell & Co., W. A., New York.
United States Radiator Corp., Detroit, Mich.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corporation, New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Sarco Co., Inc., New York.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York

VALVES, BALANCED

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, BLOW-OFF

Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Walworth Co., New York

VALVES, CHECK

Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., The, Cincinnati, Ohio.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Phila., Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., The, Cincinnati, Ohio.
Walworth Co., New York

VALVES, MAGNETIC

Absolute Con-Tac-Tor Corp., Elkhart, Ind.

VALVES, NON-RETURN

Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Capitol Brass Works, Detroit, Mich.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich
Vapor Engineering Co., New York.
Walworth Co., New York
Webster & Co., Warren, Camden, N. J.

VALVES, REDUCING

(See Regulators, Pressure).

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

VALVES, SAFETY

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
United States Radiator Corp., Detroit, Mich.
Walworth Co., New York

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Johnson Fan & Blower Co., Chicago, Ill.
Lakeside Company, The, Hermansville, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Typhoon Fan Co., New York.

VENTILATORS

American Foundry & Furnace Co., Bloomington, Ill.
Bayley Blower Co., Milwaukee, Wis.
DeBothezat Impeller Co., Inc., New York
Midwest Air Filters, Inc., Bradford, Pa.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, MUSHROOM

Aeolus Dickinson Co., Chicago, Ill.
American Blower Co., Detroit, Mich.
American Foundry & Furnace Co., Bloomington, Ill.
American Metal Products Corp., St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill

VENTILATORS, ROOF

Aeolus Dickinson Co., Chicago, Ill
American Foundry & Furnace Co., Bloomington, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
DeBothezat Impeller Co., Inc., New York
Dwyer Equipment Co., Chicago, Ill.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

Clow & Sons, James B., Chicago, Ill

WEATHER STRIPS, METAL

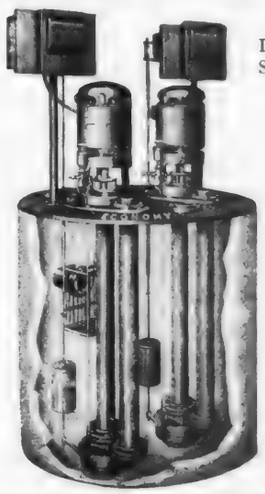
Athey Co., Chicago, Ill.

WELDERS, ELECTRIC ARC

Lincoln Electric Co., Cleveland, Ohio.

WRENCHES, STILLSON

Walworth Co., New York.



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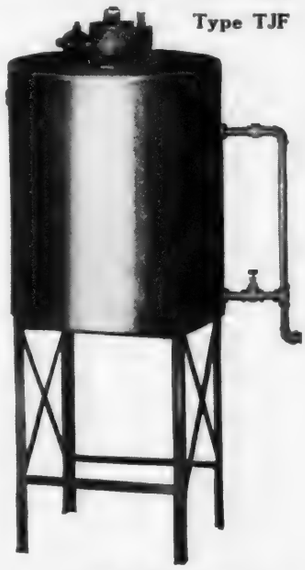

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City.....State.....

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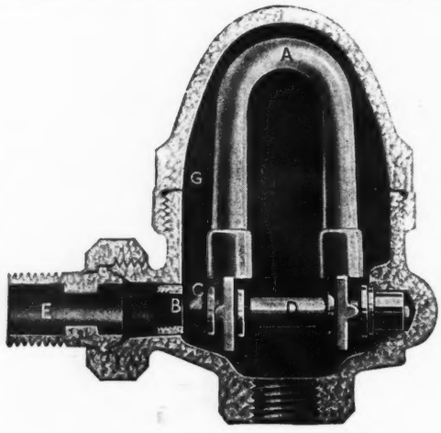
The thermostatic member that actuates the HAINES TRAP is a tempered steel Bourdon tube.



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A thirsty pigeon once saw a goblet of water painted on a signboard. Allowing zeal to outrun discretion, the pigeon with a loud whirr, flew against the signboard, receiving mortal wounds.

—Aesop's Fables

It sometimes happens, too, that a heating contractor over anxious for business, will dash wildly after a job with nothing to offer but price. Of course, he has little chance for profit, even if he gets the job. And he cannot build a profitable business on such a basis.

The alert fellow, on the contrary, discreetly submits with his bid such distinctive quality features as Weil-McLain corrugated heating surfaces, long back-and-forth fire travel and scientific combustion.

Thus the alert fellow not only gets the cream of the jobs, but makes a satisfactory day by day profit and lays the foundation for a successful business.

WEIL-McLAIN COMPANY

Manufacturing Division
Michigan City, Indiana

Executive Offices
Chicago, Illinois

Fight fuel waste with

Weil-McLain

SCIENTIFIC COMBUSTION

BOILERS

in 1928

"SEE THE WEIL-McLAIN JOBBER IN YOUR TERRITORY"

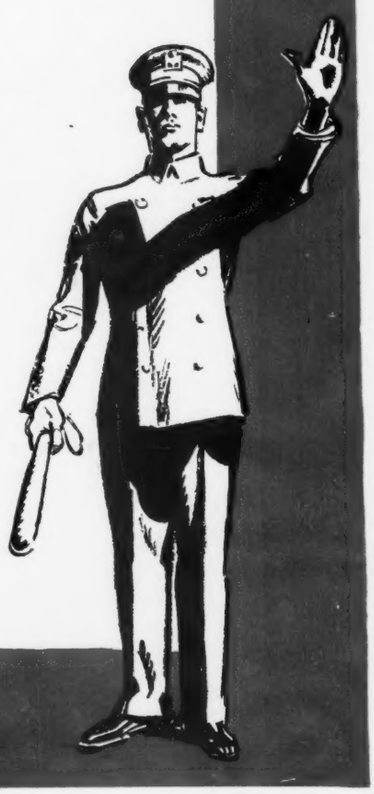
"HEAT THIEF," the first Hoffman motion picture, was shown exclusively last year to groups of heating men. Thousands saw this unusual film, in cities all over the country. Judging solely from enthusiastic comments made and hundreds of letters received from them, "Heat Thief" made a deep impression, proved that the men in the heating field are quick to appreciate this dramatic method of giving useful information. From the heating men themselves came the big idea for another film—

And now the second Hoffman PHOTOPLAY

"WE NEED a film like this," they said, "on Hoffman Controlled Heat." Not once, but many times, this idea was brought to us.

The second Hoffman motion picture, "Controlled Heat," is nearly ready for release. This unique new film is full of drama, humor, and absorbing information. From the heating difficulties of the ancient cavemen, to the most efficient modern heating system of today, this motion picture takes you. It shows you how a perfect Vapor Vacuum system operates and how progressive men are selling Controlled Heat installations.

You will want to see this interesting picture when it is privately shown in your city. Write for the date and full details of the local showing.



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